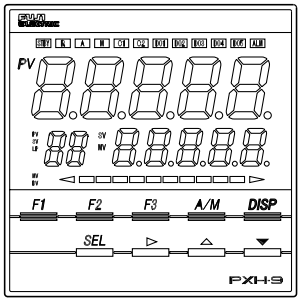


Digital Controller

Type：PXH

# User's Manual

INP-TN514206-E

# BEFORE USE

Thank you very much for purchasing Fuji's digital controller.

(1) Be sure to deliver this manual to the end user.
(2) Be sure to read this manual and grasp the concept before operating the instrument.
(3) The purpose of this manual is to provide detailed information on the function of the instrument. It does not guarantee that the instrument conforms to a specific purpose of the customer.
(4) No part or the whole of this manual may be reproduced without our permission.
(5) The contents of this manual may be changed without prior notice.

## Note

Sufficient care has been taken to assure the accuracy of this manual. Please note that we are not responsible for any damage, including indirect damage, resulting from an error in writing, missing information, or the use of the information described in the manual.

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Issued in November, 2004

# PLEASE READ FIRST

## SAFETY WARNINGS

Please read the section “Safety Warnings” thoroughly before using.
Please observe the warnings stated here as they contain important safety details. The safety warning items are divided into “WARNING” and “CAUTION” categories.

| | |
|---|---|
| ⚠WARNING | Mishandling may lead to death or serious injury. |
| ⚠CAUTION | Mishandling may cause injury to the user or property damage. |

## ⚠WARNING

**Limitations in use**

This product was developed, designed and manufactured on the premise that it would be used for general machinery. In particular, if this product is to be used for applications that require the utmost safety as described below, please take into consideration the safety of the entire system and the machine by adopting such means as a fail-safe design, a redundancy design as well as the conducting of periodical inspections.

- Safety devices for the purpose of protecting the human body
- Direct control of transportation equipment
- Airplanes
- Space equipments
- Atomic equipments, etc,

Please do not use this product for applications which directly concern human lives.

**Installation and wiring**

- This equipment is intended to be used under the following conditions.

| | | |
|---|---|---|
| Ambient temperature | −10℃ to 50℃ | |
| Ambient humidity | 90% RH or below (with no condensation) | |
| Installation category | II | by IEC1010-1 |
| Pollution level | 2 | |

- Between the temperature sensor and the location where the voltage reaches the values described below, secure clearance space and creepage distance as shown in the table below.
  If such space cannot be secured, the EN61010 safety compliance may become invalid.

| Voltage used or generated by any assemblies | Clearance Space [mm] | Creepage Space [mm] |
|---|---|---|
| Up to 50 Vrms or Vdc | 0.2 | 1.2 |
| Up to 100 Vrms or Vdc | 0.2 | 1.4 |
| Up to 150 Vrms or Vdc | 0.5 | 1.6 |
| Up to 300 Vrms or Vdc | 1.5 | 3.0 |
| Above 300 Vrms or Vdc | Please consult our distributor | |

hazardous voltage

- For the above, if voltage exceeds 50Vdc (called danger voltage), grounding and basic insulation for all terminals of the equipment and auxiliary insulation for warning outputs are required.
  Note that the insulation class for this equipment is as follows. Before installing, please confirm that the insulation class for equipment meets usage requirements.

| | |
|---|---|
| Power source | Internal Circuit |
| Digital output (Do) 1, 2 | PC Loader Interface |
| | Measurement value input 1 (PV1) |
| Digital output (Do) 3 | Measurement value input 2 (PV2) |
| Digital output (Do) 4 | Auxiliary analog Input 1 (Ai1) |
| Digital output (Do) 11 to 15 | Output 1 (Current / SSR driver) |
| | Output 2 (Current) |
| | Digital input (DI) 1 to 4 |
| | Digital input (DI) 11 to 15 |
| | Transmitter power supply |
| | RS485 |

——— Basic insulation (1500VAC)
——— Functional insulation (500VAC)
- - - - - - - - - - No insulation

- In cases where damage or problems with this equipment may lead to serious accidents, install appropriate external protective circuits.
- As this equipment does not have a power switch or fuses, install them separately as necessary. (Main power switch: 2point Breaker, fuse rating: 250V 1A)
- For power supply wiring, use wire equal to 600V vinyl insulation or above.
- To prevent damage and failure of the equipment, provide the rated power voltage.
- To prevent shock and equipment failure, do not turn the power ON until all wiring is complete.
- Before feeding power, confirm that clearance space has been secured to prevent shock and fire with the equipment.
- Do not touch the terminal while the machine is on. Doing so risks shock or equipment errors.
- Never disassemble, convert, modify or repair this equipment. Doing so carries the risk of abnormal operation, shock and fire.

**Maintenance**

- When installing and removing the equipment, turn the power OFF. Failing to do so may cause shock operational errors or failures.
- Periodic maintenance is recommended for continuous and safe use of this equipment. Some components used on this equipment have a limited life and/or may deteriorate with age.
- The warranty period for this unit (including accessories) is one year, if the product is used properly.

## ⚠Caution

**Cautions when installing**

Please avoid installing in the following locations.

- Locations in which the ambient temperature falls outside the range of –10 to 50°C when equipment is in use. (If the power supply is AC200V, the recommended maximum ambient temperature is 45°C.)
- Locations in which the ambient humidity falls outside the range of 0 to 90% RH when equipment is in use
- Locations with rapid temperature changes, leading to dew condensation
- Locations with corrosive gases (especially sulfide gas, ammonia, etc.) or flammable gases
- Locations in contact with water, oil, chemicals, steam or hot water (If the equipment gets wet, there is a risk of electric shock or fire, so have it inspected by the distributor.)
- Locations with high concentrations of atmospheric dust, salt or iron particles
- Locations with large inductive interference, resulting in static electricity, magnetic fields or noise
- Locations in direct sunlight.
- Locations that build up heat from radiant heat sources, etc.

**Cautions when attaching the panels**

- Please attach the PXH with the included Fixtures (2 pieces) to the top and bottom, and tighten with a screwdriver.
  The clamp torque is approximately 0.15 N·m (1.5 kg·cm)
  It is designed such that overtightening will cause left/right cracking to the central area of the Fixtures and hence reduce the torque.
  Cracking to the central area will not cause any problems in terms of usability of the equipment as is.
  (However, do exercise caution in not applying too much torque because the casing is made of plastic.)

**Cautions for wire connections**

- For thermocouple input, use the designated compensation lead; for resistance temperature sensors, use wires with small lead wire resistance and without any resistance difference among the three wires.
- To avoid noise conductor effects, do not use input signal wires in close proximity with electric power lines or load lines.
- Use input signal lines and output signal lines that are separated from each other and are shielded.
- If there is a lot of noise from the power source, adding an insulation transducer and using a noise filter is recommended.
  (Example: TDK ZMB22R5-11 noise filter)
  Always attach a noise filter to a panel that is grounded securely, and keep the wiring between the noise filter output side and the measuring equipment power terminal wiring to a minimum length. Please do not attach fuses and switches, etc. to the noise filter output wiring since doing so will decrease the filter's effectiveness.
- Twisting the measuring instrument wiring is effective when connecting the wires.
  (The shorter the pitch of the twist, the more effective the connection is against noise.)
- Operation preparation time is required for the contact output when power is turned on. If using it as a signal to an external interlock circuit, please couple it with a delayed relay.
- Concerning the output relay, connecting the maximum rated load will shorten the product's life; so please attach an auxiliary relay. If the output operation frequency is high, selecting a SSR/SSC drive output type is recommended.
  [Proportionate cycles] Relay output: 30 seconds or more,
  SSR/SSC drive output: 1 second or more
- When inductive loads such as magnetic opening/closing equipment, etc. as relay output equipment are connected, use of "Zetrap," manufactured by Fuji Device Technology, Co. Ltd., is recommended in order to protect the connection points against opening/closing surges and to ensure long-term use.
  Model names : ENC241D-05A (For 100V power voltage)
  ENC471D-05A (For 200V power voltage)

**Others**

- Please do not wipe the equipment with organic solvents such as alcohol or benzene, etc. If wiping is necessary, do so with a neutral cleaning agent.
- Do not use mobile phones near the instrument (within 50 cm). Otherwise malfunction may result.

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# 1 OUTLINE

Thank you very much for purchasing Fuji's digital controller. This manual describes the installation, operation, maintenance, etc. of this instrument. Read it carefully before operating the controller.

## 1-1 Code symbols

Before using the controller, check that the controller is of the type you ordered.

**[Code symbols]**

| Digit | Description | Notes |
|---|---|---|
| 4 | <Dimension of front face H x W><br>96 x 96 mm | |
| 5 | <Number of control loops/Function><br>1 loop, PID controller | |
| 6 | <Measurement value input><br>Universal input: 1 point<br>Universal input: 2 points | <br><br>* |
| 7 | <Auxiliary input><br>Without<br>DC voltage: 1 point | |
| 8 | <Version No.> | |
| 9 | <Output><br>OUT1 / OUT2<br>Current / Not fitted<br>Current / Current<br>Current / Transmitter supply<br>SSR/SSC driver / Not fitted<br>SSR/SSC driver / Current | |
| 10 | <Power supply><br>100 to 240 V AC | |
| 11 | <Communication interface><br>Without<br>RS-485 | |
| 12 | <Digital input/output><br>Digital input / Digital output (Includes control output (Relay))<br>4 points (Di1 to 4) / 2 points (Do3, Do4)<br>4 points (Di1 to 4) / 4 points (Do1 to 4)<br>9 points (Di1 to 4, Di11 to 15) / 9 points (Do1 to 4, Do11 to 15) | <br><br><br><br>* |
| 13 | <Additional specifications><br>Not fitted. | |

Digit → 1 2 3 4 5 6 7 8 – 9 10 11 12 13

P X H 9 A 1 V 0

6: 1 2 — 7: 0 1 — 9: 1 2 5 A B — 11: 0 R — 12: 0 A B

* "2" in the 6th digit and "B" in the 12 th digit can not be selected at the same time.

# 1-2 Checking the delivered items

Confirm that all of the following accessories are included.

- Digital Controller 1 unit
- Instruction Manual 1 copy
- CD-ROM 1 pc
  (Contents)
  Instruction Manual
  User's Manual
  Communication Functions Instruction Manual (Modbus)
  Communication Sample Program
  Parameter Loader Instruction Manual
  Parameter loader software
- Mounting fixture 2 pcs
- Watertight packing 1 pc
- Unit nameplate 1 pc
- Terminating resistance *1 1 pc

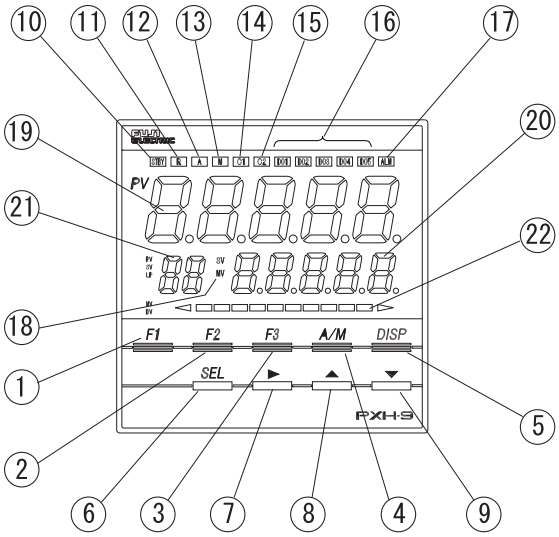
*1) Supplied only when the communications function (RS485) is selected with this model.

Option

| Name | Order No. |
|---|---|
| PC loader communication cable | ZZPPXH∗TK4H4563 |
| Terminal covers *2 | ZZPPXR1-B230 |

*2) Two covers are required per unit.

# 1-3 Operating parts and their functions




Operation Part

| Name | Function |
|---|---|
| ① F1 key | Assignable by the user. |
| ② F2 key | Assignable by the user. |
| ③ F3 key | Assignable by the user. |
| ④ A/M key (AUTO/MANUAL switch key) | Switches between AUTO mode and MANUAL mode. |
| ⑤ DISP key (switch display key) | Switches display between the set value (SV) / control output (MV).<br>Press the key to return from the setting mode to the operation mode (operation screen). |
| ⑥ SEL key (Select key) | For parameter block selection, parameter selection, and parameter setting change. |
| ⑦ ▶ key (Digit selection key) | Select a digit of data value for a desired setting change. |
| ⑧ ▲key (Up key) | Increases the data value of a desired setting change.<br>Changes the value of a set value (SV) when in operation.<br>Used to select channels and parameters and change parameter settings in the setting mode. |
| ⑨ ▼key （DOWN key） | Decreases the data value of a desired setting change.<br>Changes the value of a set value (SV) when in operation.<br>Used to select channels and parameters and change the parameter setting in the setting mode. |

* During the electrical current output, the lamp will not light.

Display

| Name | Function |
|---|---|
| ⑩ STBY Lamp | Lamp lights when in standby mode. |
| ⑪ R Lamp | Lamp lights when in REMOTE mode. |
| ⑫ A Lamp | Lamp lights when in AUTO mode. |
| ⑬ M Lamp | Lamp lights when in MANUAL mode. |
| ⑭ C1 Lamp | Lamp lights when control output 1 is ON. * |
| ⑮ C2 Lamp | Lamp lights when control output 2 is ON. * |
| ⑯ DO1 Lamp DO2 Lamp DO3 Lamp DO4 Lamp DO5 Lamp | Lamp lights when digital output 1 to 4 (DO1 to DO4) is on.<br>The lamp functions are assignable by the user.<br>Do5: None |
| ⑰ ALM Lamp | Lamp lights when alarm is activated. |
| ⑱ SV/MV Lamp | Indicates the status shown in the sub-segment display.<br>SV : Set value<br>MV : Control output value |
| ⑲ Measurement value (PV) display (red) | Displays the measurement value (PV) during operation.<br>Also displays the parameter name when setting parameters. |
| ⑳ Set value (SV) display (orange) or output value (MV) display (orange) | Displays the set values (SV) or control output value (MV) during operation. |
| ㉑ Sub-segment display | During operation :<br>When TPLT (ch8-92) is set at 10, 13, the loop number is displayed.<br>When TPLT (ch8-92) is set at 11, 14, the SV number is displayed. |
| ㉒ Bar graph display | Setting parameters : Parameter number is displayed.<br>Displays a bar graph of control output (MV) during operation. |

# 1-4 Digital characters

The following tables provide correspondence between digital characters used for the display of the controller and alphanumerical characters.

| Alphabet | Digital character | Alphabet | Digital character | Alphabet | Digital character |
|---|---|---|---|---|---|
| A |  | K | | U | |
| B |  | L | | V | |
| C | | M | | W | |
| D | | N | | X | |
| E |  | O | | Y | |
| F |  | P | | Z | |
| G |  | Q | ※ | | |
| H |  | R | | | |
| I |  | S | | | |
| J |  | T | | | |

| Numeric character | Digital character | Numeric character | Digital character |
|---|---|---|---|
| 1 | | 6 | |
| 2 | | 7 | |
| 3 | | 8 | |
| 4 | | 9 | |
| 5 | | 0 | |

* Not used by PXH.

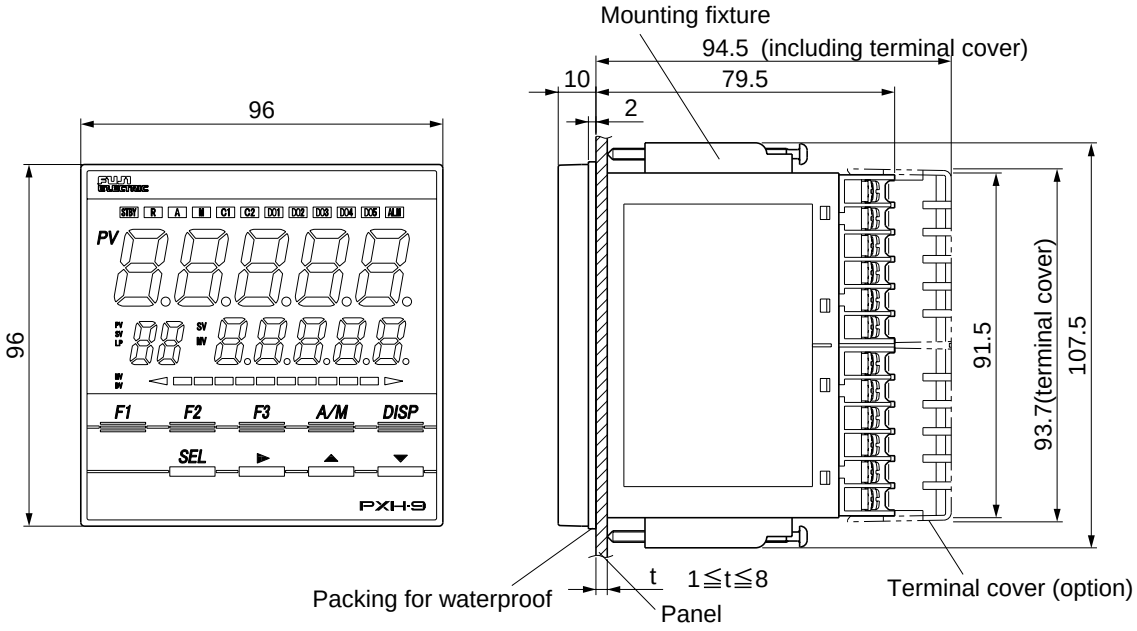
# 2 INSTALLATION AND WIRING

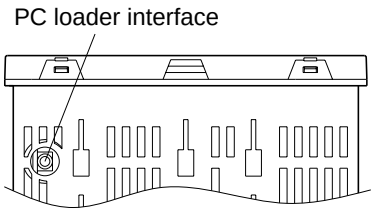
## 2-1 Installation site

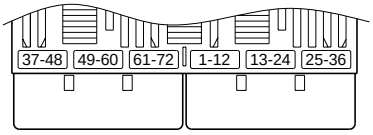
Install the controller in the following places.

- A place where ambient temperature falls within the range from −10 to 50°C, and temperature change is minimal (We recommend you to use the controller at the ambient temperature of 45ºC at the maximum if the power supply is 200V AC.)
- A place where ambient humidity falls within the range from 0 to 90%RH, and where condensation does not occur
- A place where corrosive gases (such as sulfuric gas or ammonia) or inflammable gases are not generated
- A place where vibration or impact is not directly transferred to the main unit (The output relay may malfunction because of vibration or impact.)
- A place not subjected to exposure to water, oil, chemicals, vapor, and steam (If water is splashed onto the controller, electrical leak or fire may result. Ask your distributor for maintenance in such cases.)
- A place where accumulation of heat due to radiant heat does not occur
- A place where electromagnetic interference by radios or mobile phones does not occur
- A place where dust, salt, or iron content is minimal
- A place not subjected to direct sunlight
- A place where inductive interference is large and therefore not prone to generation of static electricity, magnetism, and noise

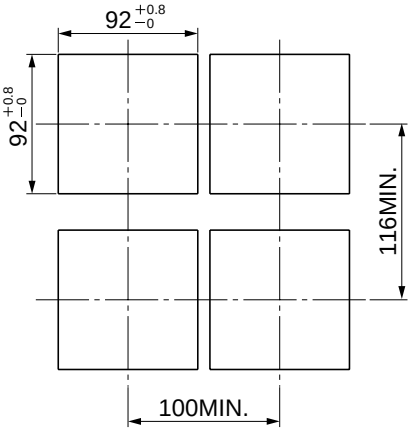
# 2-2 External and panel cut dimensions



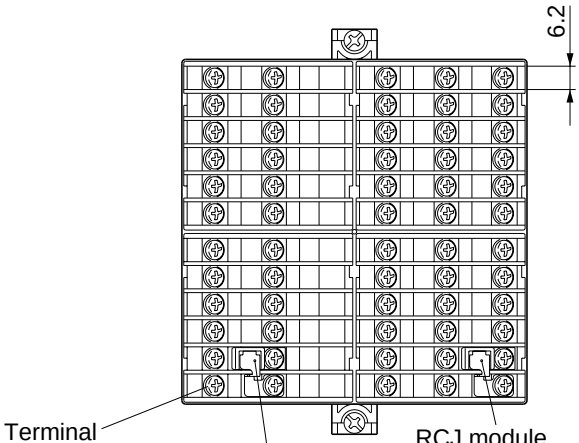




**Panel Cutout Dimensions**




Note: In the case where paint finish will be applied after panel hole-punching, take care of the finished dimensions.


6.2
Terminal screw M3
RCJ module
Remove the RCJ module at the time of input by resistance bulb.
RCJ module (for PV2)
Installed only when 2 measurement value input points are selected.
Remove the RCJ module at the time of input by resistance bulb.

# 2-3 Mounting the PXH to the panel

- Please attach the PXH with the included Fixtures (2 pieces) to the top and bottom, and tighten with a screwdriver.
  The clamp torque is approximately 0.15 N·m (1.5 kg·cm)
  It is designed such that overtightening will cause left/right cracking to the central area of the Fixtures and hence reduce the torque.
  Cracking to the central area will not cause any problems in terms of usability of the equipment as is.
  (However, do exercise caution in not applying too much torque because the casing is made of plastic.)
- The front of this equipment is wateproof in compliance with NEMA-4X standards (IP66-equivalent). However, regarding waterproofing between the equipment and the panel, use the included packing to ensure waterproofing and attach it according to the guidelines below. (Incorrect attachment may cause the equipment to lose its waterproof capabilities.)
  (1) As shown in Fig. 1, insert the panel after attaching the packing to the equipment case.
  (2) As shown in Fig. 2, tighten the fixture screws so that no gaps can remain between the equipment face, the packing and the panels. Once finished, confirm that there are no changes in shape such as displaced or improperly-fitted packing, etc. as shown in Fig. 3.
- Please exercise caution if the panel strength is weak and gaps develop between the packing and the panel, as this will result in the loss of its waterproofing capabilities.

## Mounting Method

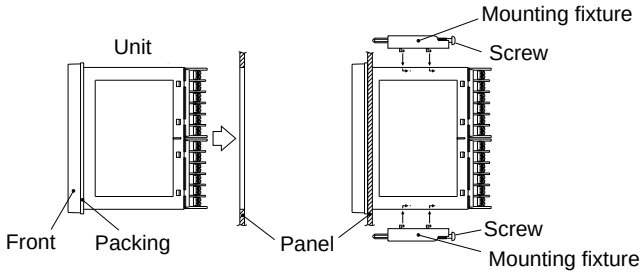



Fig. 1




Fig. 2

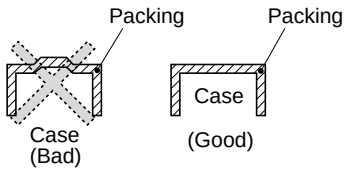



Fig. 3

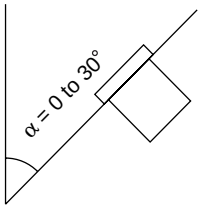



Fig. 4

Standard: vertical attachment (horizontal position fixtures)
If attached at an angle, the maximum gradient is a 30° downslope.

**(Caution)**

- In order not to hamper heat dissipation, do not block the sides of the equipment.
- Do not block the air vents on the upper part of the terminal.
- For the PXH9, please attach the Fixtures to the attachment holes in the center of the main unit.

# 2-4 Before wiring

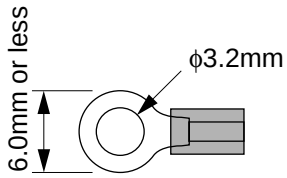
· Use wires and solderless terminals of the size shown below for connection.

Wire size

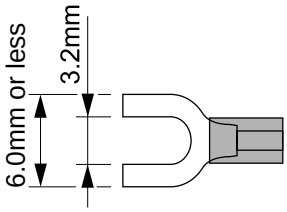
| Parts | Size |
|---|---|
| Thermocouple (Compensating lead wire) | 1.25mm$^2$ or smaller |
| Wire | 1.25mm$^2$ or smaller |

Solderless terminal size

| Applicable wire size | Fastening torque |
|---|---|
| 0.25 to 1.25mm$^2$ | 0.8N·m |




Round solderless terminal




Y-type solderless terminal

# 2-5 Wiring

- For thermocouple input, use the designated compensation lead; for resistance temperature sensors, use wires with small lead wire resistance and without any resistance difference among the three wires.
- To avoid noise conductor effects, do not use input signal wires in close proximity with electric power lines or load lines.
- Use input signal lines and output signal lines that are separated from each other and are shielded.
- If there is a lot of noise from the power source, adding an insulation transducer and using a noise filter is recommended.
  (Example: TDK ZMB22R5-11 noise filter)
  Always attach a noise filter to a panel that is grounded securely, and keep the wiring between the noise filter output side and the measuring equipment power terminal wiring to a minimum length. Please do not attach fuses and switches, etc. to the noise filter output wiring since doing so will decrease the filter's effectiveness.
- Twisting the measuring instrument wiring is effective when connecting the wires.
  (The shorter the pitch of the twist, the more effective the connection is against noise.)
- Operation preparation time is required for the contact output when power is turned on. If using it as a signal to an external interlock circuit, please couple it with a delayed relay.
- Concerning the output relay, connecting the maximum rated load will shorten the product's life; so please attach an auxiliary relay. If the output operation frequency is high, selecting a SSR/SSC drive output type is recommended.
  [Proportionate cycles] Relay output: 30 seconds or more,
  SSR/SSC drive output: 1 second or more
- When inductive loads such as magnetic opening/closing equipment, etc. as relay output equipment are connected, use of "Zetrap," manufactured by Fuji Device Technology, Co. Ltd., is recommended in order to protect the connection points against opening/closing surges and to ensure long-term use.
  Model names : ENC241D-05A (For 100V power voltage)
  ENC471D-05A (For 200V power voltage)
  Attachment position : Please connect between the relay control output connection points. (Refer to Fig. 5.)
- If using a thermocouple input, make sure that an RCJ module is connected as shown in the diagram below. (If an RCJ module is not connected, the temperature measurement cannot function.)
  To use resistance bulb input instead of thermocouple input, remove RCJ module.
  Keep the removed RCJ module, and do not forget to mount it back when input is changed again.
- Take wiring resistance into consideration when using a Zener barrier.
- In applying mV voltage, do not remove the RCJ module.
- It is dangerous to make an SSR connection when the output is set at 4-20mA, because the output will be kept "ON" even when the MV display shows –5%. Make sure to confirm the setting and the wiring before making the SSR connection.
- When the transmitter power supply model is selected, the external wiring will be connected as Fig. 6.

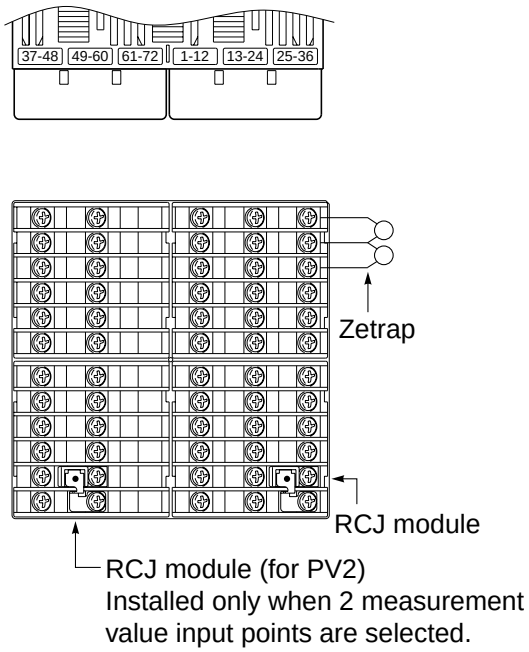



Fig. 5 Attachement position of Zetrap and RCJ module

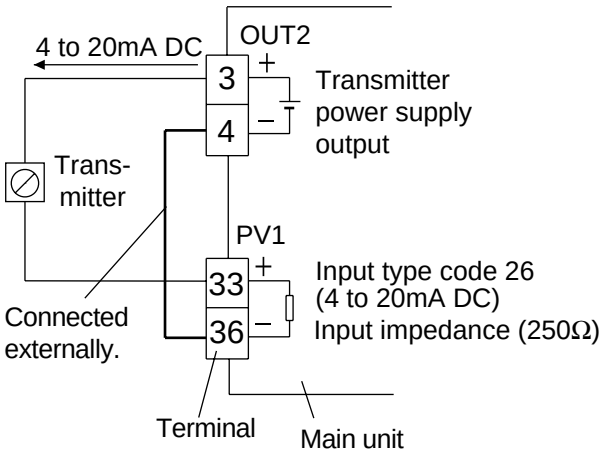
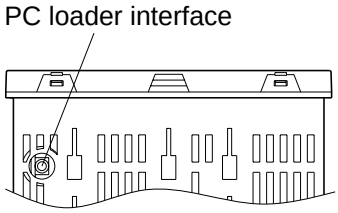
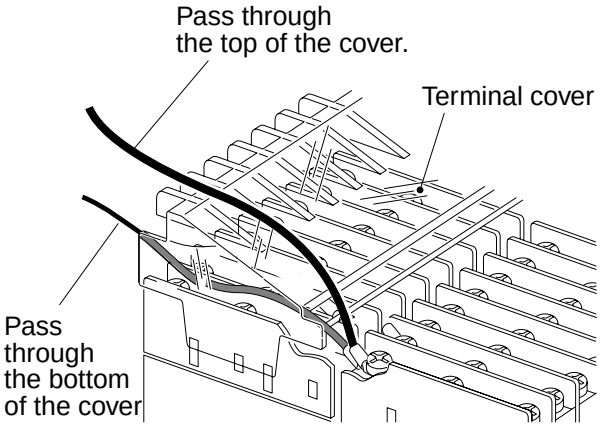



Fig. 6 External wiring for the model with the power supply to the transmitter




- To connect the main unit to a PC, connect the optional PC loader communication cable to the PC loader interface and the serial port (pin 9) of the PC.

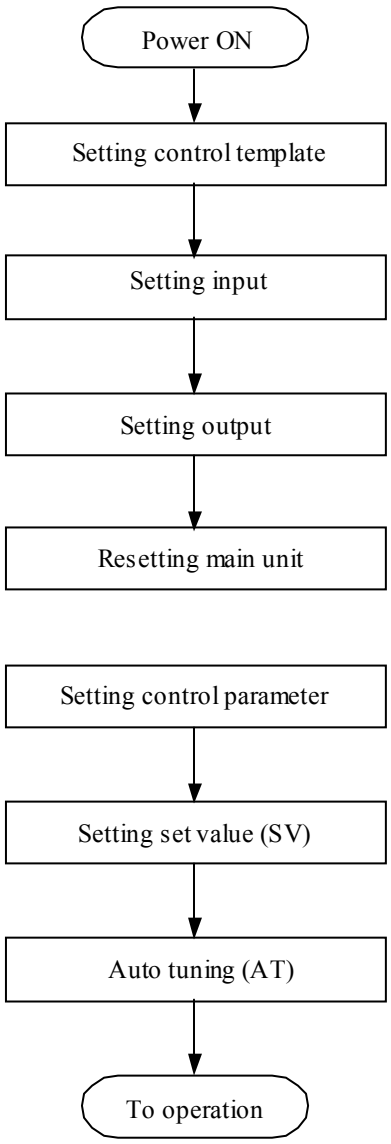
- Connection when terminal cover is used
  To connect 2 cables to one terminal, use cables of 1.25 mm² or smaller in diameter, and make connections as shown by the figure at right.



# 3 BASIC USAGE

Basic settings required in the flow from power ON to the start of operation are shown below. See the next page for basic key operations.

### Setting procedure




See 3-1 “Setting control template.”

Set measurement range, decimal point position, input type, and unit of PV1, PV2, and Ai1.
See 3-2 “Setting input.”

Type of each output can be set according to applications.
See 3-3 “Setting output type.”

Reset the main unit.
See 3-4 “Reset command.”

Set proportion cycle and operation type.
See 3-5 “Setting control parameter.”

See 3-6 “Setting the set value (SV).”
Make SV limit setting as required.

Perform PID constant auto tuning.
See 3-7 “AT (Auto tuning).”

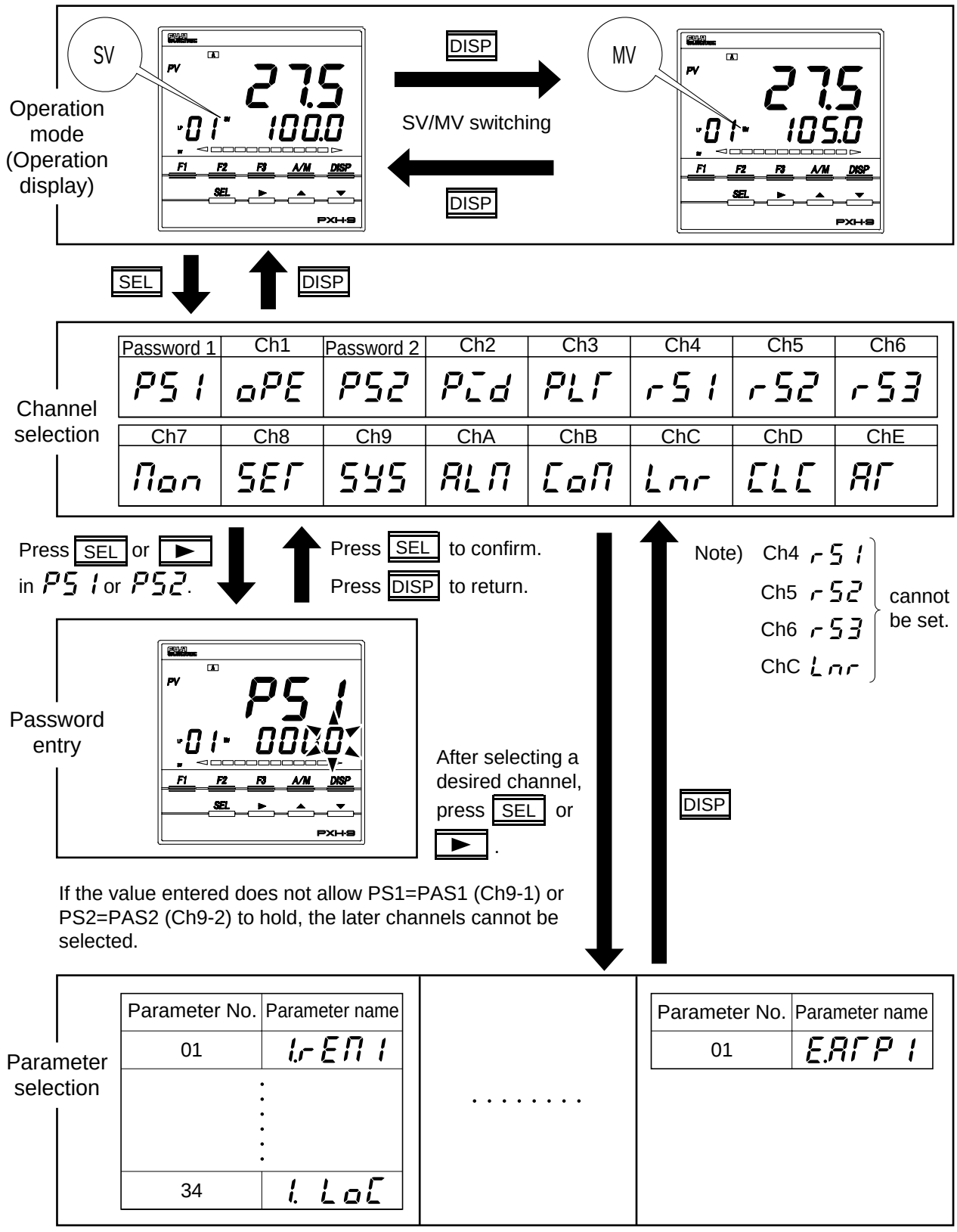
[Note]

* To enable the setting of [rEv1] of Ch2, Ch9, ChB, and Ch8 that has been registered, reset the controller or turn on the power again.
* If key operation is not performed for 10 seconds under the condition where the setting is flickering in setting change mode, the value being changed is canceled.
* This instrument is not provided with the function of automatically returning to the operation screen when no operation status is continued. Return to the operation screen manually.
* Parameters in the text

Example: STbo (Ch1 - 5)

Parameter No.
Channel No.
Parameter symbol

**Switching parameters**




*See appended parameter list.

# 3-1 Setting control template

TPLT Specifying control template (Setting range: 10, 11, 13, 14, 16)

[Description]

· Specify control templates.

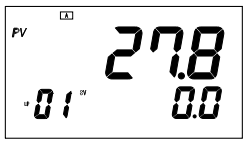
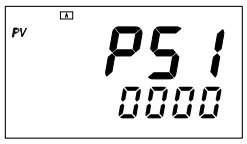
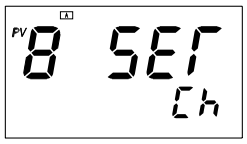
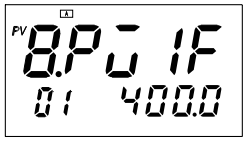
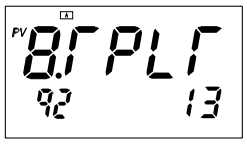
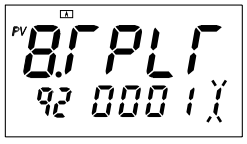
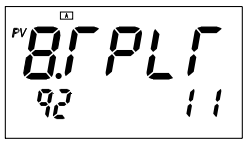
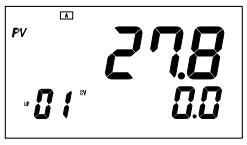
| TPLT | Control template | SV selection | Math function | |
|---|---|---|---|---|
| 10 | Single-loop basic PID control (with Math function) | — | ○ | |
| 11 | Single-loop SV selection PID control (with Math function) | ○ | ○ | |
| 13 | Single-loop basic PID control | — | — | <Factory set> |
| 14 | Single-loop SV selection PID control | ○ | — | |
| 16 | Single-loop input selection PID control (with Math function) | — | ○ | |

· Each template is provided with input conditioner function.
Input conditioner function allows the following three operations.
(1) User adjustment
(2) Square root extraction
(3) Input filter

· Math function can be selected for templates No.10 and No.11, and SV selection can be selected for templates No.11 and No.14. See the template chart on the next page for details.

* See 5-14 “Math function”.
See 4-4 “SV selection” for SV selection function.

[Setting example] Setting the template to be used to 11.

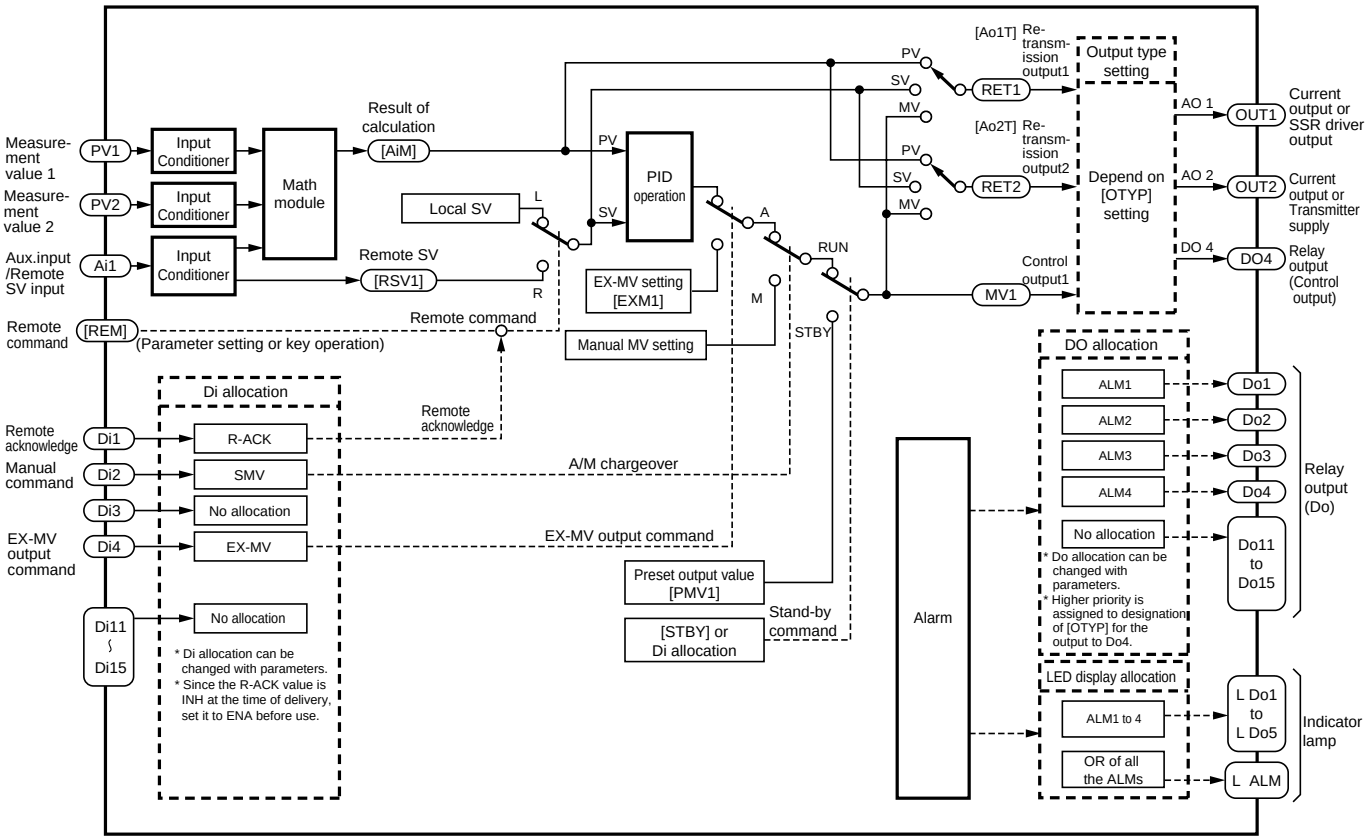
| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SEr. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8PJ IF appears and the parameter selection display is shown |
|  Parameter selection display | 5. Press the ▽ key to display 8rPLr. |
|  Setting change mode | 6. Press the SEL or the ▽ key to make the setting flicker, and set the value to 00011 using the ▷, △ or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

## rPLr =10 Single-loop basic PID control (with Math function)

Contents of input conditioner
- User adjustment
- Square root extractions
- Input filter

1 The value obtained by calculating the input value for PV1, PV2, and Ai1 can be controlled as PV.
<Operations allowed>
- Flow rate/temperature/pressure corrections
- Averaging (Weighting allowed)
- Maximum/minimum selector
- Input signal switching
(See table 9 for details of mathematical expressions.)
-

2 The same as Template No.13 except for Math function.
Note) A scale setting [UCF1, UCB1, UCD1 (ch8: 89-91)] must be made in accordance with the range resulting from the Math function.



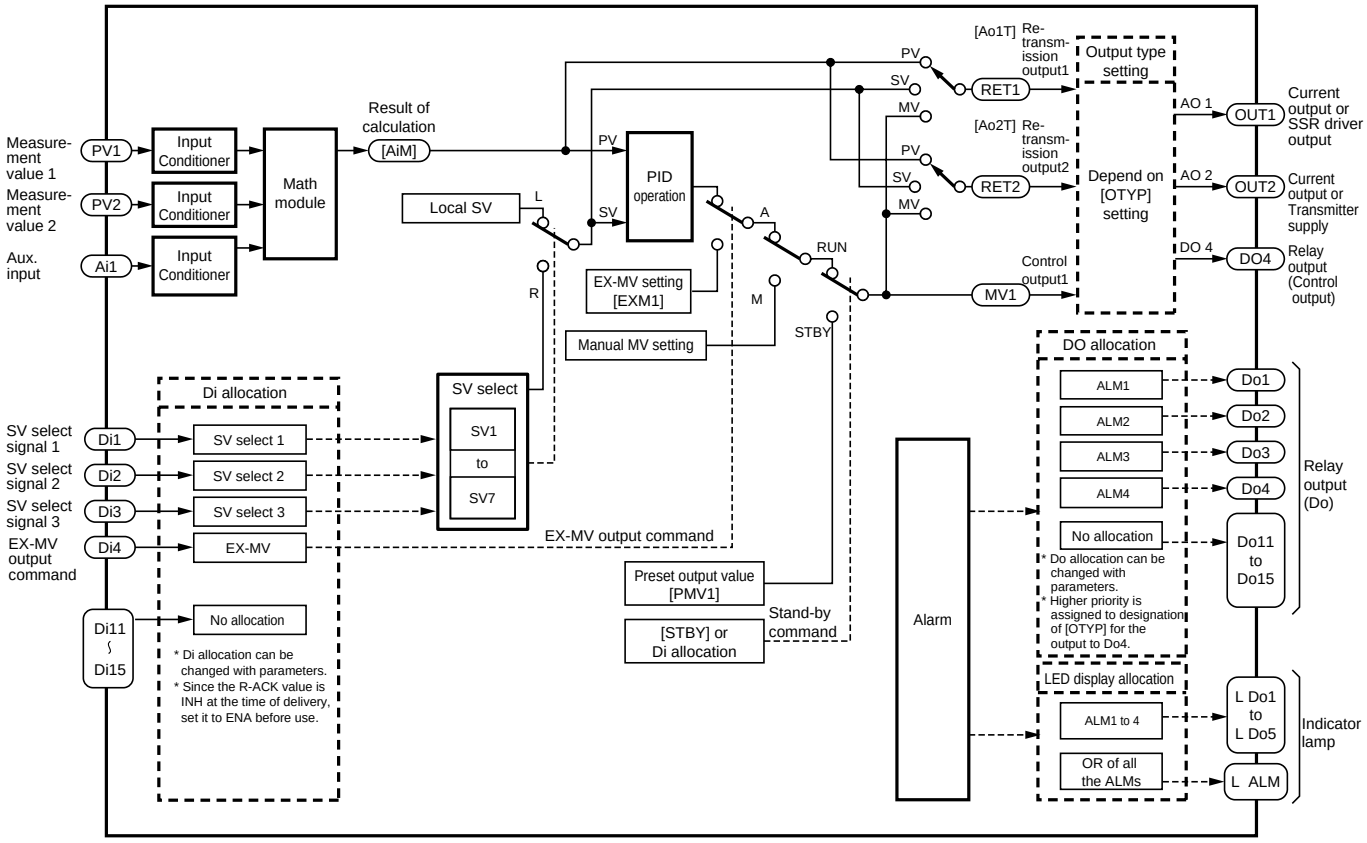
## rPLr =11 Single-loop SV selection PID control (with Math function)

1 The template is used to perform Math function with PV1, PV2, and Ai1 in SV selection type control. (See item 1 in template No.10 for Math function.)

2 The same as template No.14 except for the Math function.
Note) Scale setting [UCF1, UCB1, UCD1 (ch8: 89-91)] must be made in accordance with the range resulting from the Math function.

SV selection signal and SV number to be selected

| Selection / SV No. | SV selection Signal 1 | SV selection Signal 2 | SV selection Signal 3 |
|---|---|---|---|
| Local SV | OFF | OFF | OFF |
| SV1 | ON | OFF | OFF |
| SV2 | OFF | ON | OFF |
| SV3 | ON | ON | OFF |
| SV4 | OFF | OFF | ON |
| SV5 | ON | OFF | ON |
| SV6 | OFF | ON | ON |
| SV7 | ON | ON | ON |



## rPLr =13 Single-loop basic PID control

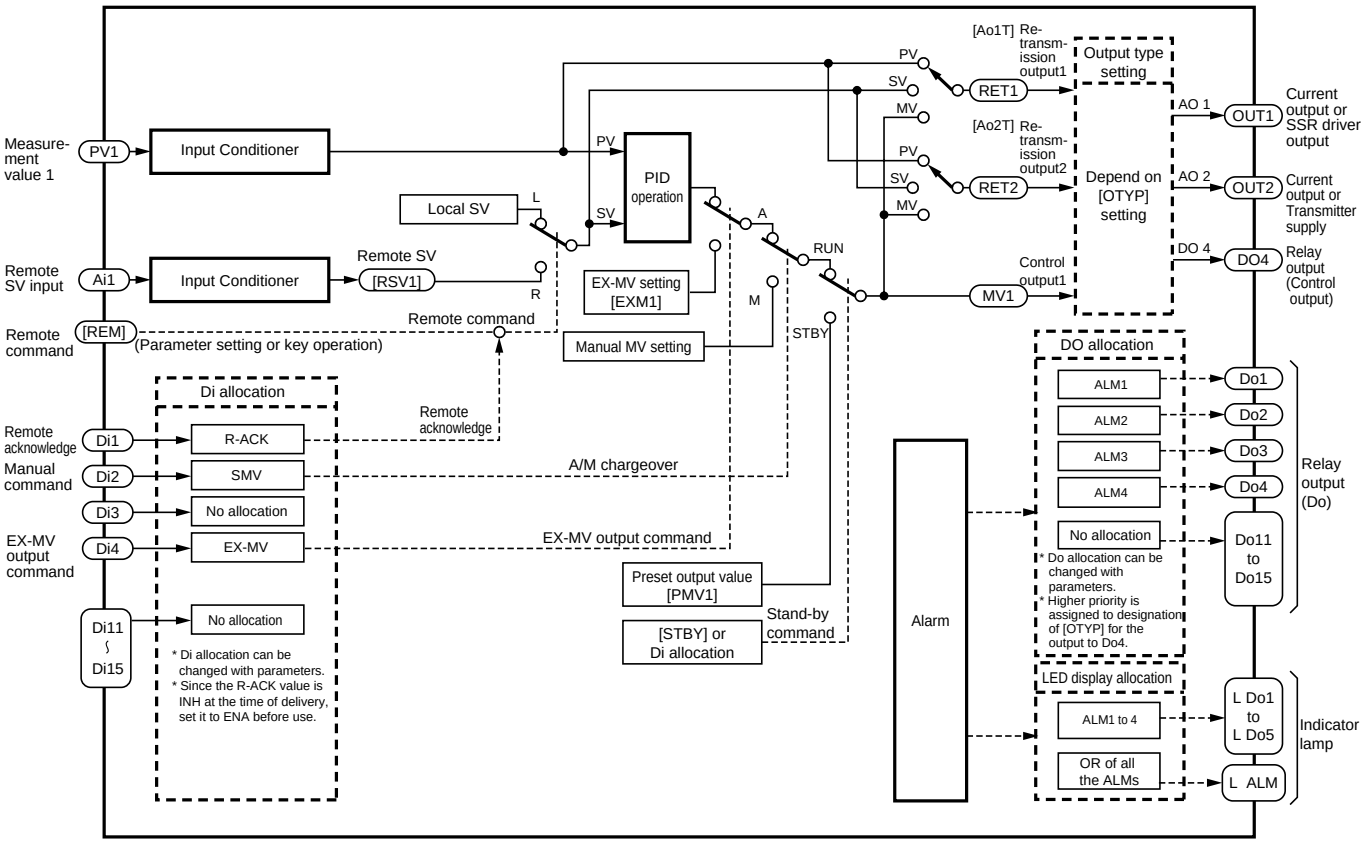
1 This is the most basic control template.

2 Control is allowd in an auto/manual/remote operation mode and by digital input.

3 Set the control output and Re-transmission output with a parameter [OTYP]. (See 3-3 for details.)

4 By changing the digital input (Di) allocations, a standby operation, etc. can be performed. (See 5-10 for details.)

5 Digital ouitput (Do) and LED lamp allocations can be changed. (See 5-11 for details.)



## TPLT =14 Single-loop SV selection PID control

1 Setting value (SV) can be selected by digital input. The SV can be selected from the local (front panel) setting value and 7 pairs of palette setting values (SV of ch3), 8 points in total.

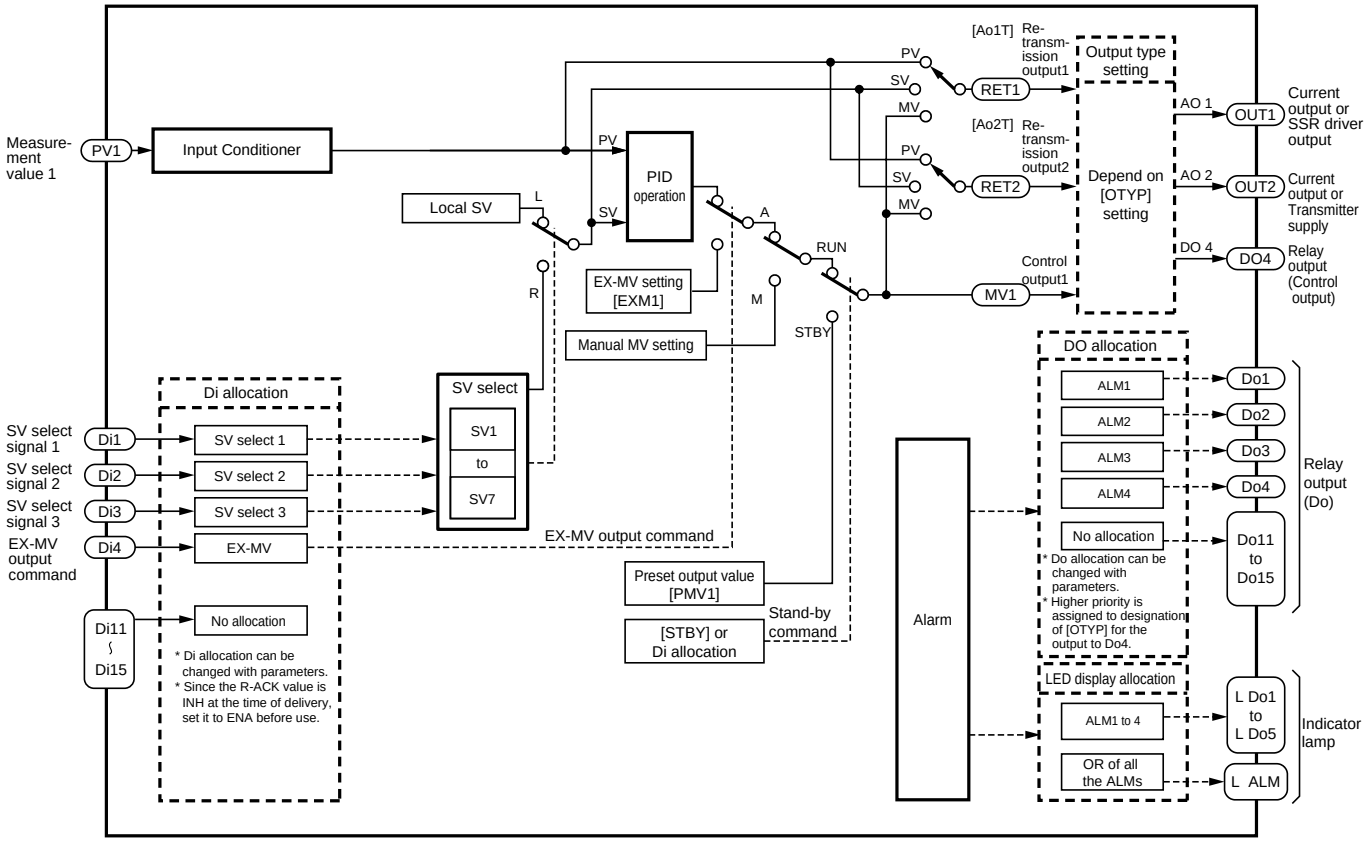
2 PID parameters can be switched according to the SV. (Set PLTS (ch9-31) according to SV.)

3 Set control output and Re-transmission output by parameter [OTYP]. (See 3-3 for details.)

4 By changing the allocation of the digital input (Di), a standby operation, etc. can be performed. (See 5-10 for details.)

5 Digital output (Do) and LED lamp allocations can be changed. (See 5-11 for details.)

· SV selection signals and selected SV Nos. are the same as those of template No.11.



## Template No.16 Single-loop input selection PID control (with Math function)

Contents of input conditioner
- User adjustment
- Square root extraction
- Input filter

1 Input selection function

The input for PV, RSV, EXMV, and FF (*1) can be selected.
Select each input with constant parameters (CN01 to CN16) in "CH8 (SET) input/output definition."
See the following table for the meaning of constant parameter set values.

| Set value | PV input selector | RSV input selector | EXMV input selector | FF input selector | FF operation INH command |
|---|---|---|---|---|---|
| | CN01 | CN02 | CN03 | CN04 | CN05 |
| −19999 to −1 | 0 | 0 | 0 | 0 | Allowed |
| 0 | PV1 input | PV1 input | PV1 input | PV1 input | Allowed |
| 1 | PV2 input | PV2 input | PV2 input | PV2 input | Prohibited |
| 2 | Ai1 input | Ai1 input | Ai1 input | Ai1 input | Allowed |
| 3 | AiM (Result of Math function) | AiM (Result of Math function) | AiM (Result of Math function) | AiM (Result of Math function) | Allowed |
| 4 | 0 | 0 | EXM1 parameter | 0 | Allowed |
| 5 to 99999 | 0 | 0 | 0 | 0 | Allowed |
| Initial value | 0 (PV1) | 2 (Ai1) | 2 (Ai1) | 4 (EXM1 parameter) | 1 (Prohibited) |

Note: Each input becomes 0 for the type without PV2 or Ai input.
Note: To enable the change of input selection, reset the main unit.

2 Math function

The result of Math function can be used as inputs for PV, RSV, EXMV, and FF (*1).
See "5-14 Math function".
Note: Scale setting [UCF1, UCB1, UCD1 (Ch8-89 to 91)] must be made according to the range of the result of Math function.

3 Feed Forward function

The result of the following expression is added to PID operations as Feed Forward element.

$$FF = KF1 \times (Input - B1F) + B2F$$

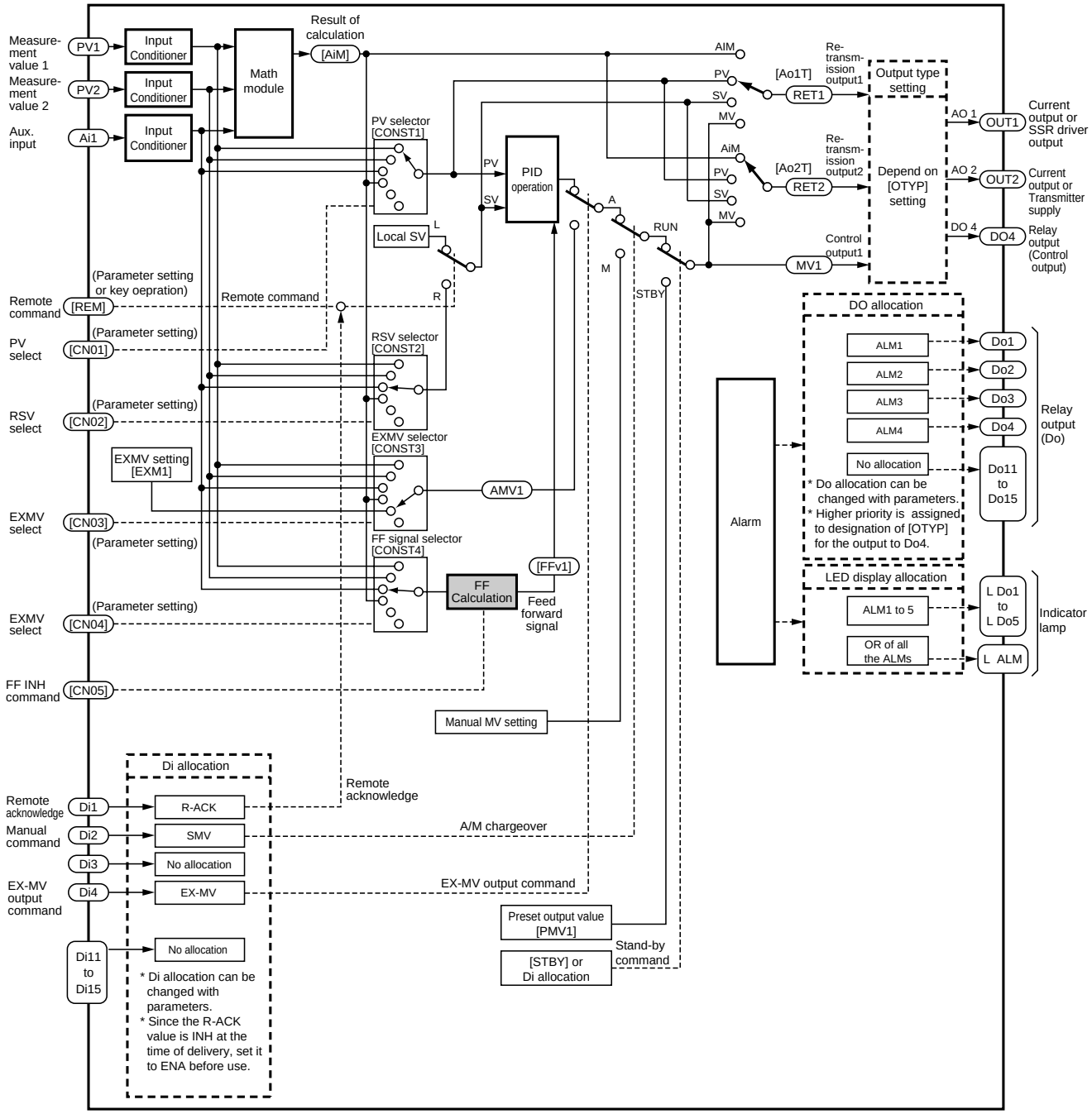
Set KF1, B1F, and B2F values with "Ch2 PID (control parameter)."
To use Feed Forward function, set CN05 to 0 (use allowed).

4 Re-transmission output

PV, SV, MV, DV, or AiM (result of Math function) can be selected as re-transmission output.
See "3-9 Re-transmission output" for details of selection method.

*1: FF stands for Feed Forward element.

## CPLC =16 Single-loop input selection PID control (with Math function)



# 3-2 Setting input

Make the setting of each input of PV1, PV2, and Ai1.
Parameters you have to make the setting are shown below.

<PV1 input>

| Parameter symbol | | Meaning |
|---|---|---|
| PU 1F | Pv1F (Ch8-1) | Measurement value input (PV1) full scale setting |
| PU 1b | Pv1b (Ch8-2) | Measurement value input (PV1) base scale setting |
| PU 1d | Pv1d (Ch8-3) | Measurement value input (PV1) decimal point position setting |
| PU 1r | Pv1T (Ch8-4) | Measurement value input (PV1) input type setting |
| PU 1U | Pv1U (Ch8-5) | Measurement value input (PV1) unit setting |

<PV2 input>

| Parameter symbol | | Meaning |
|---|---|---|
| PU2F | Pv2F (Ch8-14) | Measurement value input (PV2) full scale setting |
| PU2b | Pv2b (Ch8-15) | Measurement value input (PV2) base scale setting |
| PU2d | Pv2d (Ch8-16) | Measurement value input (PV2) decimal point position setting |
| PU2r | Pv2T (Ch8-17) | Measurement value input (PV2) input type setting |
| PU2U | Pv2U (Ch8-18) | Measurement value input (PV2) unit setting |

<Ail input>

| Parameter symbol | | Meaning |
|---|---|---|
| AI 1F | Ai1F (Ch8-40) | Analog input (Ai1) full scale setting |
| AI 1b | Ai1b (Ch8-41) | Analog input (Ai1) base scale setting |
| AI 1d | Ai1d (Ch8-42) | Analog input (Ai1) decimal point position setting |
| AI 1r | Ai1T (Ch8-43) | Analog input (Ai1) input type setting |

· Subsequent descriptions are given with PV1 taken as example. To use PV2 or Ai1, check the above parameter symbols, and make the setting, following the same procedure.

Note

· To enable the setting, reset the main unit. See 3-4 “Reset command” for resetting procedure. Check whether the setting has been enabled with the display and parameter setting on the operation screen.

**Pv 1F** Measurement value input (PV1) full scale (Setting range: −19999 to 99999)

**Pv 1b** Measurement value input (PV1) base scale (Setting range: −19999 to 99999)

[Description]

- Set the upper limit PV1F (Ch8-1) and the lower limit PV1b (Ch8-2) of the measurement range.
- Select decimal point position with Pv1d (Ch8-3), and input type with Pv1T (Ch8-4).
- See the following table for details of input range.
- To use Pv2 and Ai1, set Pv2F (Ch8-14), Pv2b (Ch8-15), Ai1F (Ch8-40), and Ai1b (Ch8-41), following the same procedure.

| Input Type | | Measurement Range (℃) | Measurement Range (℉) |
|---|---|---|---|
| Resistance bulb IEC | Pt100Ω | 0 to 150 | 32 to 302 |
| | | 0 to 300 | 32 to 572 |
| | | 0 to 500 | 32 to 932 |
| | | 0 to 600 | 32 to 1112 |
| | | −50 to 100 | −58 to 212 |
| | | −100 to 200 | −148 to 392 |
| | | −150 to 600 | −238 to 1112 |
| | | −150 to 850 | −238 to 1562 |

• To use Zener barrier for Pt input, user adjustment is required.

Note 1)

R thermocouple 0 to 500℃
B thermocouple 0 to 400℃
} Proper values may not be displayed within these ranges due to the sensor's characteristics.

Note 2) When using at the settings below the minimum range stated in the table above, the input accuracy is not guaranteed.

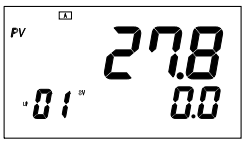
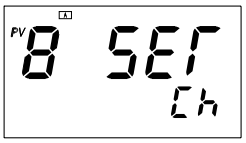
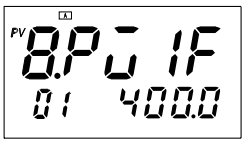
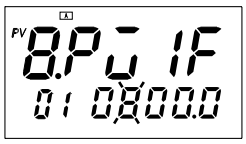
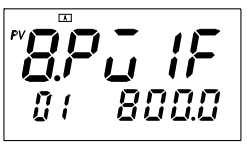
Note 3) In the −50%FS to +50%FS display, values under −199.99 will not be displayed.

| Input Type | | Measurement Range (℃) | Measurement Range (℉) |
|---|---|---|---|
| Thermocouple | J | 0 to 400 | 32 to 752 |
| | J | 0 to 1000 | 32 to 1832 |
| | K | 0 to 400 | 32 to 752 |
| | K | 0 to 800 | 32 to 1472 |
| | K | 0 to 1200 | 32 to 2192 |
| | R | 0 to 1600 | 32 to 2912 |
| | B | 0 to 1800 | 32 to 3272 |
| | S | 0 to 1600 | 32 to 2912 |
| | T | −200 to 200 | −328 to 392 |
| | T | −200 to 400 | −328 to 752 |
| | E | 0 to 800 | 32 to 1472 |
| | E | −200 to 800 | −328 to 1472 |
| | PR40/20 | 0 to 1800 | 32 to 3272 |
| | N | 0 to 1300 | 32 to 2372 |
| | PL-II | 0 to 1300 | 32 to 2372 |
| | WRe5-26 | 0 to 2300 | 32 to 4172 |
| DC voltage | 1 to 5V DC | −19999 to 99999 (Scaling is possible) | |
| | 0 to 5V DC | | |
| | 0 to 10V DC | | |
| | 0 to 10mV DC | | |
| | 0 to 50mV DC | | |
| DC current | 4 to 20mA DC | | |
| | 0 to 20mA DC | | |

**Note**

- To enable the setting, reset the main unit. See 3-4 “Reset command” for resetting procedure. Check whether the setting has been enabled with the display and parameter setting on the operation screen.

[Setting example] Changing scale to 0 to 800

| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SET. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8PU 1F appears and the parameter selection display is shown. |
|  Setting change mode | 5. Press the SEL or the ▷ key to make the setting flicker, and set the value to 0800.0 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 6. Press the SEL key to register the setting. |
| Operation display | 7. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

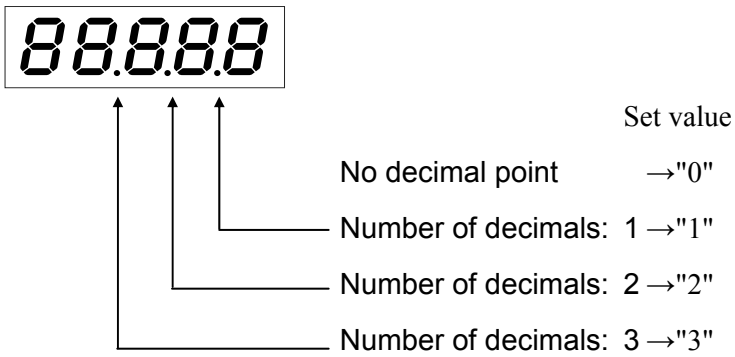
Note

- To enable the setting, reset the main unit. See 3-4 “Reset command” for resetting procedure. Check whether the setting has been enabled with the display and parameter setting on the operation screen.

**Pv1d** Measurement value input (PV1) decimal point position (Setting range: 0 to 3)

[Description]

· Select the decimal point position of the measurement input value (PV1).

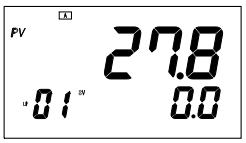
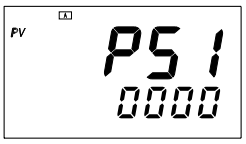
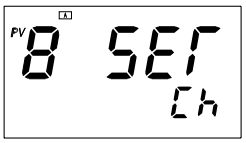
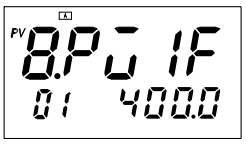
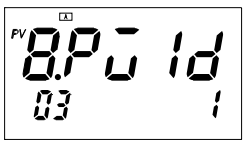
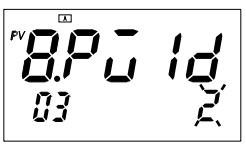
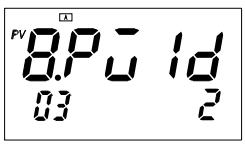
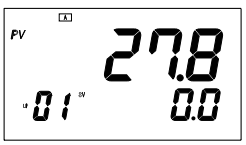



· To use PV2 or Ai1, set Pv2d (Ch8-16) or Ai1d (Ch8-42), following the same procedure.

Note

· To enable the setting, reset the main unit. See 3-4 “Reset command” for resetting procedure. Check whether the setting has been enabled with the display and parameter setting on the operation screen.

[Setting example] Selecting 2 decimal places

| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SET. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8PU IF appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8PU Id. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00002 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

**P_ IT** Setting input type of measurement value input (PV1) (Setting range: 0 to 27)

[Description]

- Specify input type.
- See the following table for details of input type and setting (input code).

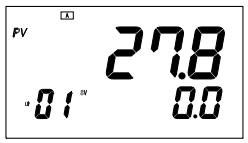
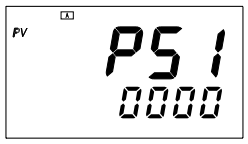
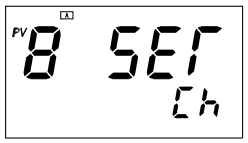
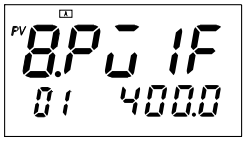
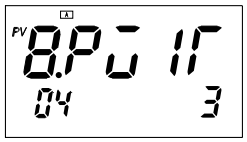
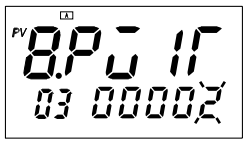
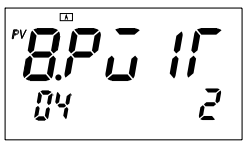
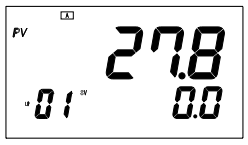
| Input Type | Code |
|---|---|
| Resistance bulb | |
| • Pt100Ω (IEC) | 1 |
| For thermocouple | |
| • J | 2 |
| • K | 3 |
| • R | 4 |
| • B | 5 |
| • S | 6 |
| • T | 7 |
| • E | 8 |
| • PR40/20 | 9 |

| Input Type | Code |
|---|---|
| • N | 12 |
| • PL-II | 13 |
| • WRe5-26 | 14 |
| DC voltage | |
| • 1 to 5V DC | 16 |
| • 0 to 5V DC | 17 |
| • 0 to 10V DC | 18 |
| • 0 to 10mV DC | 19 |
| • 0 to 50mV DC | 20 |
| DC current | |
| • 4 to 20mA DC | 26 |
| • 0 to 20mA DC | 27 |

*For Ai1, only DC voltage (code 16 to 18) settings are possible.

- To use PV2 or Ai1, set Pv2T (Ch8-17) or Ai1T (Ch8-43), following the same procedure.

[Setting example] Selecting Pt input

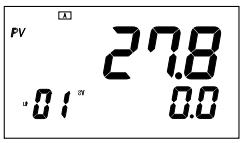
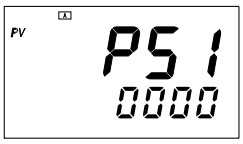
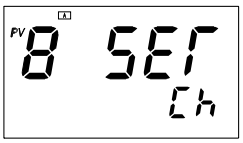
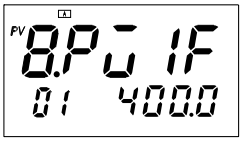
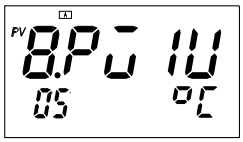
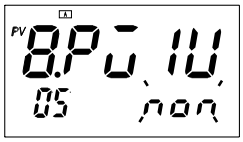
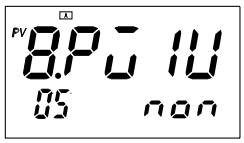
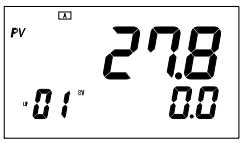
| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SEr. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8.PU IF appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8.PU IT. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00002 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

**P_1U** Selecting the unit of measurement value input (PV1) (Setting range: non, °F, °C)

[Description]

- Select a measurement unit from the following.
  - non : No unit
  - °F :°F unit
  - °C : °C unit
- To use PV2, set Pv2U (Ch8-18), following the same procedure.

[Setting example] Changing the unit from °C to non

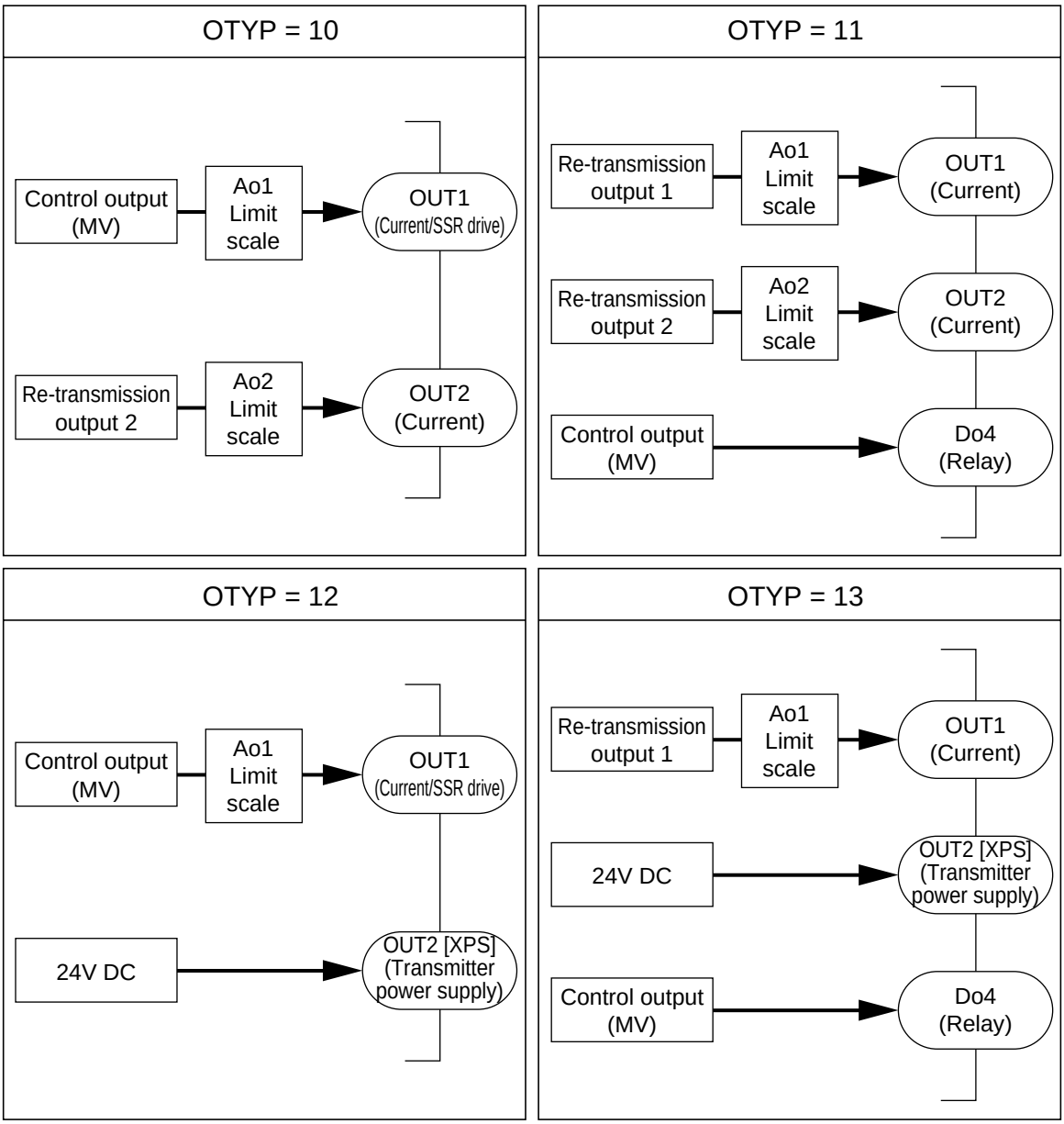
| Display | Operation procedure |
|---|---|
|  <br>Operation display | 1. Check that the operation display is shown. |
|  <br>Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  <br>Channel selection display | 3. Press the ▽ key to display 8 SET. |
|  <br>Parameter selection display | 4. Press the SEL or the ▷ key, and 8.PU IF appears and the parameter selection display is shown. |
|  <br>Parameter selection display | 5. Press the ▽ key to display 8.PU IU. |
|  <br>Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to non using the ▷, △, or the ▽ key. |
|  <br>Parameter selection display | 7. Press the SEL key to register the setting. |
|  <br>Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

# 3-3 Setting output type

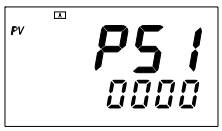
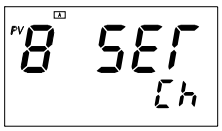
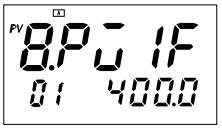
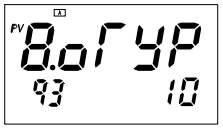
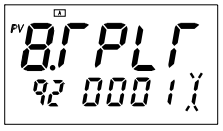
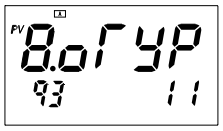
oTYP Selecting output type (Setting range: 10 to 13)

[Description]

- Select a control output type according to applications.
- See the following figure for details of each output type.



[Setting example] Changing setting so that both relay output and Re-transmission output (2 points) can be used

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SEr. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8.PG 1F appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8.oryP. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00011 using the ▷, △, or the ▽ key.<br>7. Press the SEL key to register the setting. |
|  Parameter selection display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation dispaly. |
| Operation display | |

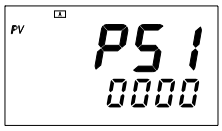
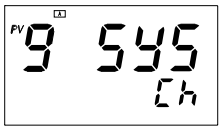
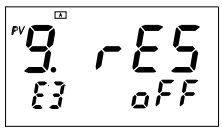
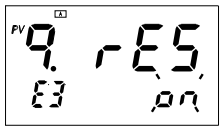
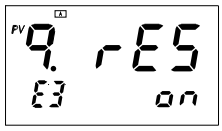
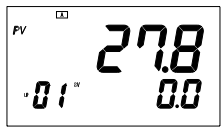
# 3-4 Reset command

| rES | Resetting the main unit (Setting range: ON, OFF) |
|---|---|

[Description]

- Selecting ON resets the main unit.
- To enable parameters selected for Ch8, Ch9, ChB, and Ch2 (rEv1), reset the main unit or turn on the power again.

## [Setting example] Resetting

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 9 SYS. |
| Parameter selection display | 4. Press the SEL or the ▷ key, and 9.PAS1 appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 9.rES. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to on using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. "WAIT RESET" appears and the bar graph comes on. After resetting is completed, the operation display automatically appears. |
| | * Resetting takes about 10 seconds. |

# 3-5 Setting control parameter

rC1 Proportion cycle of control output (MV) (Setting range: 1 to 150 sec)

[Description]

- The setting is applicable to relay output and SSR drive output.
- While input is kept within the proportional band, output is turned ON/OFF at fixed intervals, which is called proportion cycle.
  By making the proportion cycle time shorter, ON-OFF switching time of the operation unit is made shorter, which allows delicate control.

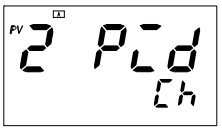
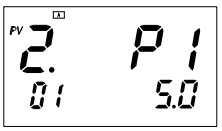
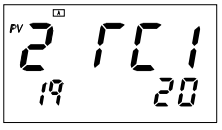
**In the case of contact output**

The higher the output frequency is, the more delicate control is assured, but service life of contact and operation unit is made shorter. Adjust the proportion cycle time to acquire balance between controllability and service life.
Target: 30 sec

**In the case of SSR drive output**

If there is no trouble with the operation unit, select short time setting.
Target: 1 sec

[Setting example] Changing proportion cycle from 30 sec to 20 sec

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 2 PCd. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 2.P1 appears and the parameter selection display is shown. |
| Parameter selection display | 5. Press the ▽ key to display 2.rC1. |
| Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00020 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
| Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

rEV1 Control operation type (Setting range: NRML, REV)

[Description]

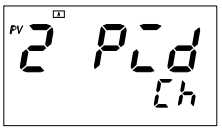
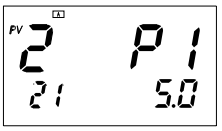
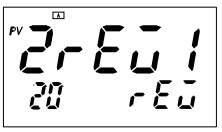
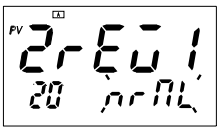
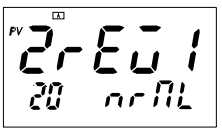
· There are two control operation types. One is normal operation, and the other is reverse operation.

NRML (Normal operation): If measurement value (PV) becomes larger than the set value (SV), control output becomes larger.

REV (Reverse operation): If measurement value (PV) becomes smaller than the set value (SV), control output becomes larger.

| Control operation type | Application |
|---|---|
| NRML (Normal operation) | Cooling control |
| REV (Reverse operation) | Heating control |

[Setting example] Changing control operation direction from REV to NRML

| Display | Operation procedure |
|---|---|
| <br>Operation display | 1. Check that the operation display is shown. |
| <br>Channel selection display | 2. Press the [SEL] key, and the channel selection display appears, displaying PS1. |
|  <br>Channel selection display | 3. Press the [▽] key to display 2 PCd. |
|  <br>Parameter selection display | 4. Press the [SEL] or the [▷] key, and 2.P1 appears and the parameter selection display is shown. |
|  <br>Parameter selection display | 5. Press the [▽] key to display 2.rEU1. |
|  <br>Setting change mode | 6. Press the [SEL] or the [▷] key to make the setting flicker, and set the value to nrML using the [▷], [△], or the [▽] key. |
|  <br>Parameter selection display | 7. Press the [SEL] key to register the setting. |
| <br>Operation display | 8. Press the [DISP] key once to return to the parameter selection display. Press it again to return to the operation display. |

# 3-6 Setting the set value (SV)

## Setting the set value (SV)

[Description]

- Set value (SV) is the target value of the control.
- The upper limit value and the lower limit value of the setting can be set with Sh1 (Ch2-7) and SL1 (Ch2-8).

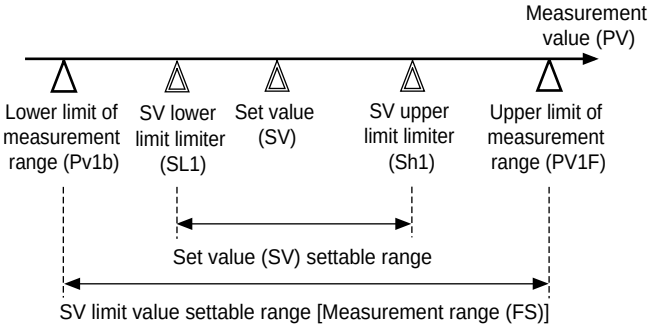
[Setting example] Changing the set value (SV) from 0.0°C to 60.0°C

| Display | Operation procedure |
|---|---|
| <br>Operation display<br> <br>SV change mode<br> <br>Operation display | 1. Check that "SV 0.0" is shown on the operation display.<br>2. Press the [▷] key to make the SV flicker.<br>3. Set the SV value to 60.0 using the [▷], [△], or the [▽] key.<br>4. Press the [SEL] key to complete the operation.<br>* If the [DISP] key is pressed while the setting is flickering, or no operation status continues for 10 seconds or longer, the value being changed is canceled.<br>* The SV can also be changed without making the value flicker by pressing the [▷] key. Just change the value using the [△] or the [▽] key. |

| SH 1 | SV upper limit value (Setting range: –25 to 125%FS) |
|---|---|
| SL 1 | SV lower limit value (Setting range: –25 to 125%FS) |

[Description]

- Set the settable range of set value (SV).
- The SV upper and lower limit values, Sh1 (Ch2-7) and SL1 (Ch2-8), can be set within the range of Pv1 scale from Pv1F (Ch8-1) to Pv1b (Ch8-2). (See the following figure.)


Measurement value (PV)
Lower limit of measurement range (Pv1b)
SV lower limit limiter (SL1)
Set value (SV)
SV upper limit limiter (Sh1)
Upper limit of measurement range (PV1F)
Set value (SV) settable range
SV limit value settable range [Measurement range (FS)]

[Note]

- Be sure to set the following parameters before setting Sh1 (Ch2-7) and SL1 (Ch2-8) parameters.
  - Measurement range upper limit setting Pv1F (Ch8-1)
  - Measurement range lower limit setting Pv1b (Ch8-2)
  - Decimal point position Pv1d (Ch8-3)
- After changing Pv1F (Ch8-1), Pv1b (Ch8-2), and Pv1d (Ch8-3) parameters, reset the controller, and then set Sh1 (Ch2-7) and SL1 (Ch2-8) parameters.
- Set the limit values so that Sh1 (Ch2-7) becomes equal or larger than SL1 (Ch2-8).

# 3-7 AT (Auto tuning)

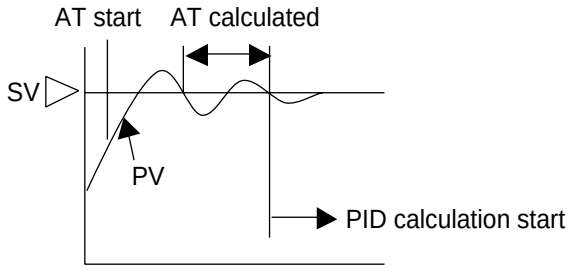
| | |
|---|---|
| AT | Auto tuning function (Setting range: OFF, ON1) |
| ATP1 | Setting auto tuning method (Setting range:NRML, LPV) |

[Description]

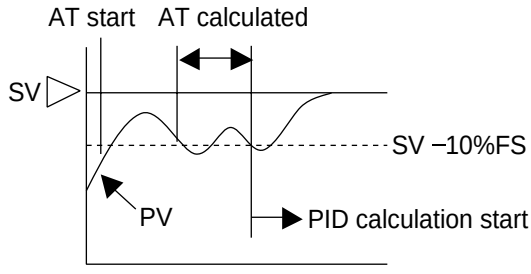
- The controller automatically measures, calculates, and sets PID constant, which is called auto tuning. Perform auto tuning after setting of input range (Pv1F (Ch8-1), Pv1b (Ch8-2), Pv1d (Ch8-3)), set value (SV), and proportion cycle TC1 (Ch2-19) is completed.
- When auto tuning is normally completed, the automatically set PID parameter value is maintained even if the power is turned off. If the power is turned off during the process of auto tuning, start again from the beginning. (PID value does not change.)
- Since ON-OFF operation (2-position operation) is performed during auto tuning, PV may fluctuate greatly depending on the process. Do not perform auto tuning for the processes where great fluctuation of PV is not allowed. Do not perform auto tuning, either, for the processes where response is quick such as pressure control or flow rate control.
- If auto tuning is not completed in 4 hours, it may not be performed properly. Check input/output wiring and parameters such as control output (forward, reverse) and input sensor type.
- If input range (Pv1F (Ch8-1), Pv1b (Ch8-2), and Pv1d (Ch8-3)) is changed or the operation of control target is changed because great change is made to the SV, perform auto tuning again.

| Parameter | | Description |
|---|---|---|
| Ch E | ATP1 | Auto tuning type<br>MRML: Standard type (with reference to SV)<br>LPV: Low PV type (With reference to SV −10%FS) |
| Ch 1 | PLrn | Palette No. used for control (Reflect the result of AT.)<br>0: Local PID<br>1 to 7: Palettes No.1 to 7 |

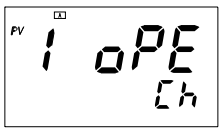
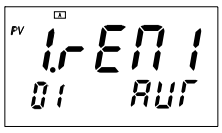
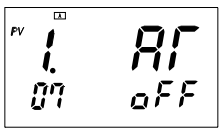
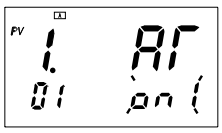
(1) Standard type (ATP1=NRML)




(2) Low PV type (ATP1=LPV)
Overshoot at the time of tuning is reduced.



## [Setting example] Performing auto tuning

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the [SEL] key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the [▽] key to display 1oPE. |
|  Parameter selection display | 4. Press the [SEL] or the [▷] key, and 1rEN1 appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the [▽] key to display 1. AT. |
|  Setting change mode | 6. Press the [SEL] or the [▷] key to make the setting flicker, and set the value to on1 using the [▷], [△], or the [▽] key. |
| Parameter selection display | 7. Press the [SEL] key to register the setting. |
| Operation display | 8. Press the [DISP] key once to return to the parameter selection display. Press it again to return to the operation display. |

* While auto tuning is in progress, the decimal point of the figure on the right of the lower row is kept flickering. It goes off when auto tuning is completed.

# 3-8 Alarm function

1TP to 8TP Setting alarm type (Setting range: 0 to 38)

[Description]

- Set the operation type of alarms 1 to 8.
- See the following figure for details of alarm type.

| | 1TP to 8TP | Alarm Type | Operation Diagram |
|---|---|---|---|
| | 0 | No alarm | PV |
| Absolute value Alarm | 1 | Upper limit absolute | ALn, PV |
| | 2 | Lower limit absolute | ALn, PV |
| | 3 | Upper limit absolute (w/hold) | ALn, PV |
| | 4 | Lower limit absolute (w/hold) | ALn, PV |
| Deviation Alarm | 5 | Upper limit deviation | ALn, SV, PV |
| | 6 | Lower limit deviation | ALn, SV, PV |
| | 7 | Upper/lower limit deviation | ALn, ALn, SV, PV |
| | 8 | Upper limit deviation (w/hold) | ALn, SV, PV |
| | 9 | Lower limit deviation (w/hold) | ALn, SV, PV |
| | 10 | Upper/lower limit deviation (w/hold) | ALn, ALn, SV, PV |
| Range Alarm | 11 | Range upper/lower limit deviation (ALM1/2 inde-pendent operation) | ALn, ALn, SV, PV |

| | 1TP to 8TP | Alarm Type | Operation Diagram |
|---|---|---|---|
| Upper/ lower limit Alarm | 16 | Upper/lower limit absolute | An-L, An-H, PV |
| | 17 | Upper/lower limit deviation | An-L, An-H, SV, PV |
| | 18 | Upper limit absolute Lower limit deviation | An-L, SV, An-H, PV |
| | 19 | Lower limit absolute Upper limit deviation | An-H, An-L, SV, PV |
| | 20 | Upper/lower limit absolute (w/hold) | An-L, An-H, PV |
| | 21 | Upper/lower limit deviation (w/hold) | An-L, An-H, SV, PV |
| | 22 | Upper limit absolute Lower limit deviation (w/hold) | An-L, SV, An-H, PV |
| | 23 | Upper limit deviation Lower limit absolute (w/hold) | An-H, An-L, SV, PV |
| Range Alarm | 24 | Range upper/lower limit absolute | An-L, An-H, PV |
| | 25 | Range upper limit/lower limit deviation | An-L, An-H, SV, PV |
| | 26 | Range upper limit absolute Lower limit deviation | An-L, SV, An-H, PV |
| | 27 | Range upper limit deviation Lower limit absolute | An-H, An-L, SV, PV |
| Range Alarm | 28 | Range upper limit/lower limit absolute (w/hold) | An-L, An-H, PV |
| | 29 | Range upper limit/lower limit deviation (w/hold) | An-L, An-H, SV, PV |
| | 30 | Range upper limit absolute Lower limit deviation (w/hold) | An-L, SV, An-H, PV |
| | 31 | Range upper limit deviation Lower limit absolute (w/hold) | An-H, An-L, SV, PV |
| Limit | 32 | SV upper/lower limit | An-L, An-H, SV |
| Rate of change | 35 | PV rate of change Upper/lower limit | 0%, ALn, 100, PV change ratio among 5 cycles |
| Timer | 36 | ON delay timer | DI, OUT, dLYn |
| | 37 | OFF delay timer | DI, OUT, dLYn |
| | 38 | ON/OFF delay timer | DI, OUT, dLYn, dLYn |

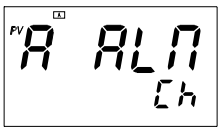
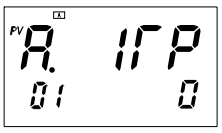
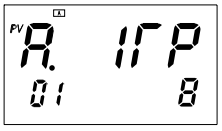
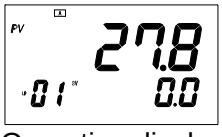
**Caution** The Hold Function:

This is an alarm for a situation when the alarm does not turn ON immediately, and the value shifts to outside the range once and then reenters within the range, even when the measured value is within the range of the alarm at the time the power is turned on.

Notes)

- After changing the alarm type, confirm the alarm setting values.
  Alarm setting values may change by this change of the alarm type, but this is normal.
- Caution: The alarm latch function cannot be used when using the OFF delay timer.
- ALn : Indicates the AL1 (ch1-10) to AL8 (ch1-31) alarm setting values.
- An-H : Indicates the A1-H (ch1-12) to A8-H (ch1-33) alarm setting values.
- An-L : Indicates the A1-L (ch1-11) to A8-L (ch1-32) alarm setting values.
- dLYn : Indicates the 1dLY (chA-4) to 8dLY (chA-39) alarm ON delay setting values.

[Setting example] Setting alarm type of Alarm 1 to upper limit deviation (with hold)

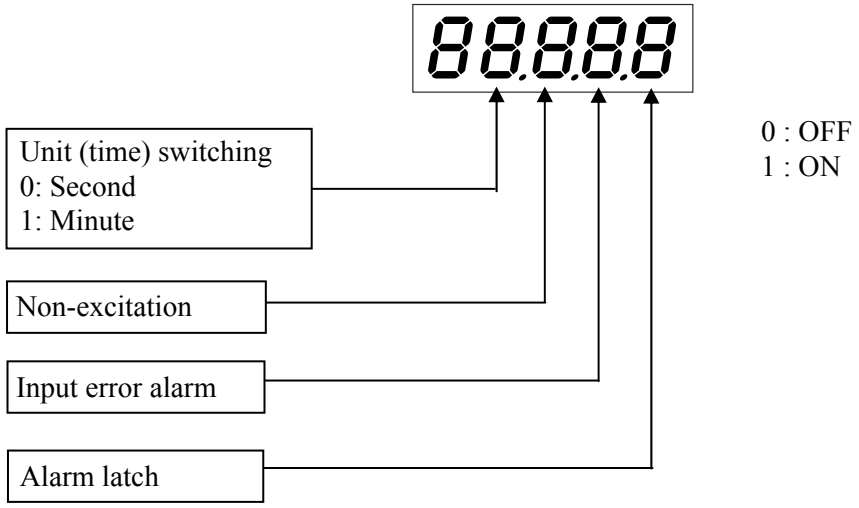
| Display | Operation procedure |
|---|---|
| <br>Operation display | 1. Check that the operation display is shown. |
| <br>Channel selection display | 2. Press the [SEL] key, and the channel selection display appears, displaying PS1. |
|  <br>Channel selection display | 3. Press the [▽] key to display A ALM. |
|  <br>Parameter selection display | 4. Press the [SEL] or the [▷] key, and A.IRP appears and the parameter selection display is shown. |
| <br>Setting change mode | 5. Press the [SEL] or the [▷] key to make the setting flicker, and set the value to 00008 using the [▷], [△], or the [▽] key. |
|  <br>Parameter selection display | 6. Press the [SEL] key to register the setting. |
|  <br>Operation display | 7. Press the [DISP] key once to return to the parameter selection display. Press it again to return to the operation display. |

1oP to 8oP Setting alarm options (Setting range: 0000 to 1111)

[Description]

Setting alarm options

· Switching of alarm unit (time) and function setting can be made. (See the following figure).

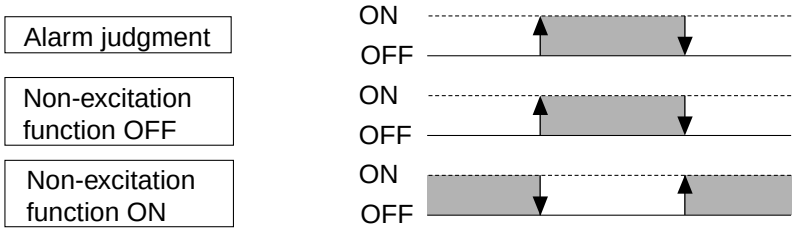



· Unit (time) switching is used for 1dLY (ChA-4) to 8dLY (ChA-39).

What is excitation/non excitation function?

It is a function that makes the alarm output excited or not excited and outputs to the alarm relay. (When the function is set to ON, the alarm is output when not excited.)

Excitation/non excitation function




**[Note]**

If power is turned OFF or during standby, alarm is not output (OFF) even if non-excitation function is set to ON.

What is input error alarm function?

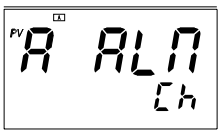
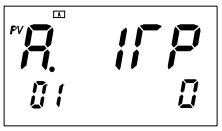
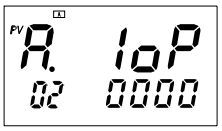
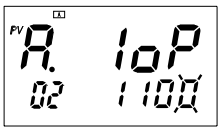
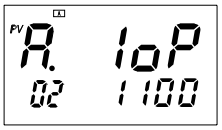
It is a function that turns ON the alarm relay when an error occurs to the main unit.

What is alarm latch function?

It is a function that maintains alarm ON status once the alarm is turned ON. Following procedures are available to reset the alarm latch.

1) Turn on the power of the controller again.
2) Set the alarm latch setting to OFF.
3) Reset using the alarm latch reset command LACh (Ch1-8).
4) Reset by DI input.
5) Reset by communication.

[Setting example] Setting the unit to minute, non-excitation to ON, input error alarm to OFF, and alarm latch to OFF

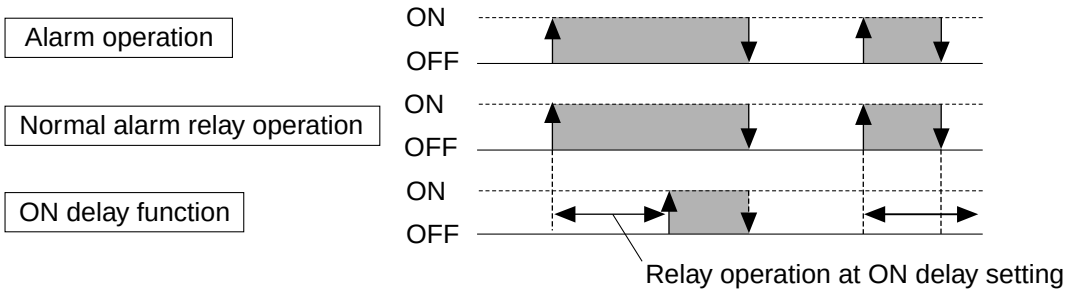
| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display A ALN. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and A 1rP appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display A 1oP. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 1100 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
| Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

| | | | |
|---|---|---|---|
| 1dLY | to | 8dLY | Setting alarm delay time (Setting range: 0 to 9999) |
| 1hYS | to | 8hYS | Setting alarm hysteresis (Setting range: 0.00 to 50.00%FS) |

[Description]

Setting alarm delay time

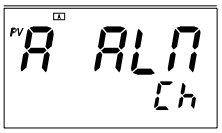
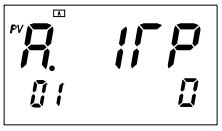
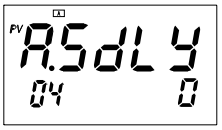
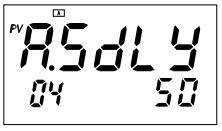
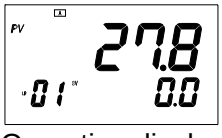
· When alarm ON conditions are met, alarm is set to ON after selected ON delay time elapses.




Setting alarm hysteresis

· Set the operation dead band (hysteresis).
· By setting alarm hysteresis, fluctuation of output is prevented and the output is stabilized. Setting can be made according to applications.

[Setting example ] Setting delay time of Alarm 5 to 50

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display A ALN. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and A 1rP appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display A.SdLY. |
| Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00050 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

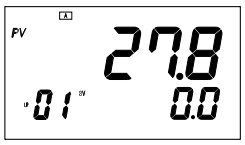
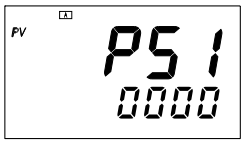
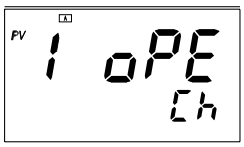
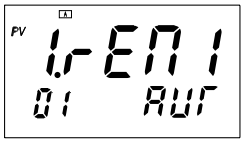
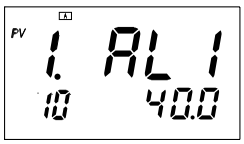
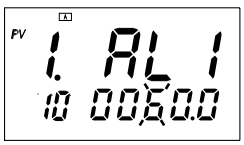
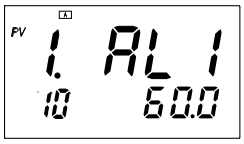
| | | | | |
|---|---|---|---|---|
| AL 1 | to | AL8 | Alarm setting | Setting range: 0 to 100%FS absolute value alarm, −100 to 100%FS deviation alarm |
| A1-L | to | A8-L | Alarm lower limit setting | |
| A1-h | to | A8-h | Alarm upper limit setting | |

[Description]

- Set the operation value of alarms from 1 to 8.
- Display/non display status of AL1 (Ch1-10) to AL8 (Ch1-31), A1-L (Ch1-11) to A8-L (Ch1-32), A1-h (Ch1-12) to A8-h (Ch1-33) changes automatically according to the type of alarms selected. (See the following table for details.)

| Setting of 1TP to 8TP | Displayed parameter |
|---|---|
| 1 to 11, 35 | AL1 to AL8 |
| 16 to 32 | A1-h to A8-h |
| | A1-L to A8-L |

[Setting example] Setting alarm 1 setting to 60.0

| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display loPE. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 1rEN1 appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 1. AL1. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00600 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

* When 1TP is set to 16-32, AL1 is not displayed. See the table on the previous page.

# 3-9 Re-transmission output

Ao 1T Setting output type of re-transmission output 1 (Setting range: PV, SV, MV, DV, AiM, S1, S2, S3)

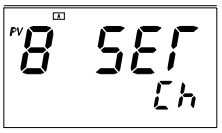
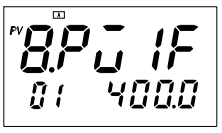
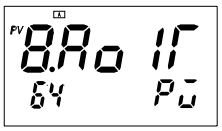
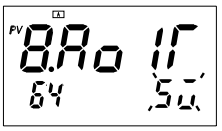
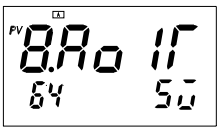
[Description]

· See the following table for details of output type.

| Ao1T | Meaning | Remarks |
|---|---|---|
| PV | Measurement value (PV) | |
| SV | Set value (SV) | |
| MV | Operation output value (MV) | |
| DV | Deviation (PV – SV) | |
| AiM | Result of Math function | Valid only when TPLT-16 is selected. The output becomes 0% if selection other than TPLT-16 is made. |
| S1 | Not used | Output becomes 0% when S1, S2, or S3 is selected. |
| S2 | Not used | |
| S3 | Not used | |

· To use output scaling, make the scaling setting of Ao1H (Ch8-66) and Ao1L (Ch8-67).
· To use Ao2, make the setting of Ao2T (Ch8-70) in the same way.

[Setting example] Changing the type of transfer output 1 from PV to SV

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SET. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8.PU 1F appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8.Ao 1F. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to SU using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
| Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

| Ao 1h | Upper limit value of the scale of re-transmission output 1 (Setting range: −130.0% to 130.0%) |
|---|---|

| Ao 1L | Lower limit value of the scale of re-transmission output 1 (Setting range: −130.0% to 130.0%) |
|---|---|

[Description]

- Set the upper limit value and lower limit value of the scaling of re-transmission output.
- The unit of setting is %.

| Output type | Meaning of % |
|---|---|
| PV/SV/DV | Percentage to input measurement range |
| MV | Output value |

Note 1: Use the following expression to calculate the setting. (Also see the following setting examples.)

Setting (%) = (A / B) × 100 (%)
A = Temperature to be set – Setting of parameter Pv1b (Ch8-2)
B = Setting of parameter Pv1F (Ch8-1) – Setting of Pv1b (Ch8-2)

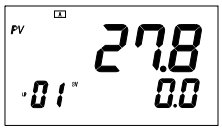
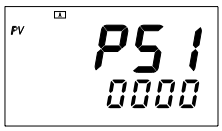
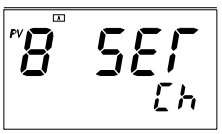
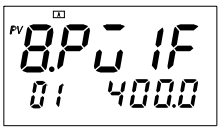
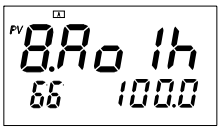
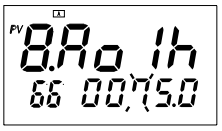
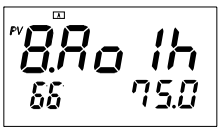
- When the value of re-transmission output type (SV for example) becomes equal to the setting of Ao1L (Ch8-67), the re-transmission output becomes 0% (output).
- When the value of re-transmission output type (PV for example) becomes equal to the setting of Ao1h (Ch8-66), the re-transmission output becomes 100% (output).
- To use Ao2h (Ch8-72), make the setting of Ao2h (Ch8-72) and Ao2L (Ch8-73) in the same way.
- Be sure to make the setting so that the setting of Ao1L (Ch8-67) becomes smaller than that of Ao1h (Ch8-66).

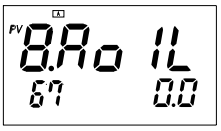
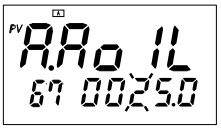
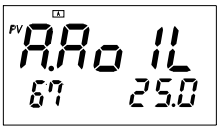
[Setting example] Performing scaling to allow 0% output when PV (value of re-transmission output type) is 100°C, and 100% output when it is 300°C, with the input type of K thermocouple of 0 to 400°C

Since measurement range is from 0 to 400°C, Pv1b = 0 (lower limit value of the measurement range), and Pv1F = 400 (upper limit value of the measurement range). Therefore, the values of A and B in the expression on the previous page are calculated as follows.

A = (100°C – 0) or (300°C – 0), B = 400 – 0 = 400

1) Setting of Pv1b: At what % position is 100°C in 0 to 400°C range? = 25% (= 100 – 0) / 400 × 100 [%])
   → Pv1b = 25.0%
2) Setting of Pv1F: At what % position is 300°C in 0 to 400°C range? = 75% (= 300 – 0) / 400 × 100 [%])
   → Pv1F = 75.0%

| Display | Operation procedure |
|---|---|
|  Operation display | 1. Check that the operation display is shown. |
|  Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SEr. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8.Pb 1F appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8.Ao 1h. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 0075.0 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to complete the setting of 8.Ao 1h. |

| Display | Operation procedure |
|---|---|
|  <br>Parameter selection display<br>  <br>Setting change mode<br>  <br>Parameter selection display<br> <br>Operation display | 8. Press the [▽] key to display 8.Ao IL .<br><br>9. Press the [SEL] or the [▷] key to make the setting flicker, and set the value to 0025.0 using the [▷], [△], or the [▽] key.<br><br>10. Press the [SEL] key to complete the setting of 8.Ao IL .<br><br>11. Press the [DISP] key once to return to the parameter selection display. Press it again to return to the operation display. |

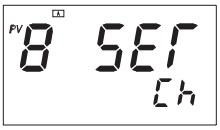
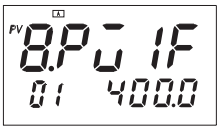
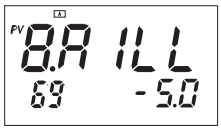
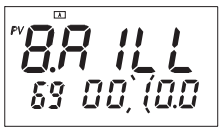
| A1Lh | Upper limit value of re-transmission output (Setting range: –25.0% to 105.0%) |
|---|---|

| A1LL | Lower limit value of re-transmission output (Setting range: –25.0% to 105.0%) |
|---|---|

[Description]

- Set the limit values of re-transmission output.
- When setting Ao2, set A2Lh and A2LL as well in the same way.

[Setting example] Changing lower limit setting of re-transmission 1 output from –5% to 10% —

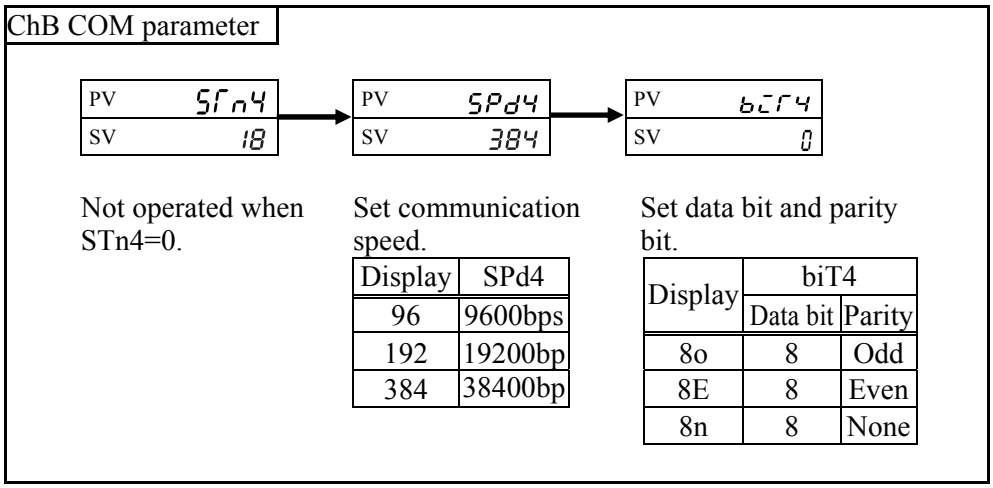
| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display 8 SET. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and 8.PJ 1F appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display 8.A 1LL. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 00 10.0 using the ▷, △, or the ▽ key. |
| Parameter selection display | 7. Press the SEL key to register the setting. |
| Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

# 3-10 Setting communications (applicable only when RS485 is provided)

| | |
|---|---|
| STn4 | RS485 station No. (Setting range: 0 to 255) |
| SPd4 | RS485 communication speed (Setting range: 96, 192, 384) |
| bCT4 | RS485 bit format (Setting range: 8o, 8n, 8E) |

[Description]

- Reading and writing of internal data are allowed with MODBUS communications.
- See the following figure for details of parameter setting.



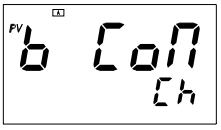
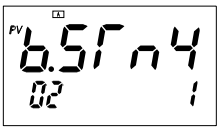
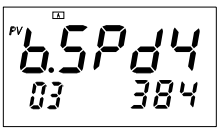
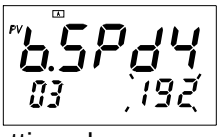
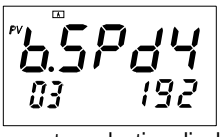
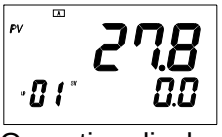

| Display | SPd4 |
|---|---|
| 96 | 9600bps |
| 192 | 19200bp |
| 384 | 38400bp |

| Display | biT4 | |
|---|---|---|
| | Data bit | Parity |
| 8o | 8 | Odd |
| 8E | 8 | Even |
| 8n | 8 | None |

- Selected parameters are not enabled unless the power is turned on again. Be sure to reset the instrument or turn on the power again.

* See “Instruction Manual for Communication Functions (MODBUS)” for details of reading and writing of internal data and communications.

[Setting example] Changing communication speed from 38400bps to 19200bps

| Display | Operation procedure |
|---|---|
| Operation display | 1. Check that the operation display is shown. |
| Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  Channel selection display | 3. Press the ▽ key to display b CoN. |
|  Parameter selection display | 4. Press the SEL or the ▷ key, and bSrn4 appears and the parameter selection display is shown. |
|  Parameter selection display | 5. Press the ▽ key to display bSPd4. |
|  Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 192 using the ▷, △, or the ▽ key. |
|  Parameter selection display | 7. Press the SEL key to register the setting. |
|  Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

SPd2 PC loader interface (RC232C) communication speed (Setting range: 96, 192, 384)

bIT2 PC loader interface (RS232C) bit format (Setting range: 8o, 8n, 8E)

[Description]

· See the following figure for details of parameter setting.

ChB COM parameter

| PV | SPd2 |
|---|---|
| SV | 384 |

→

| PV | bIT2 |
|---|---|
| SV | 0 |

Set communication speed.

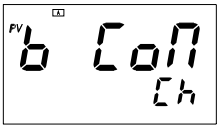
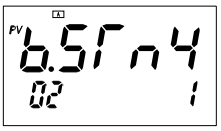
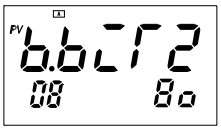
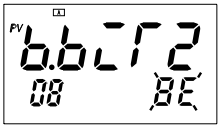
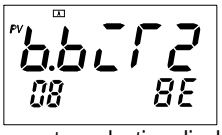
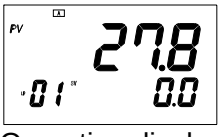
| Display | SPd2 |
|---|---|
| 96 | 9600bps |
| 192 | 19200bps |
| 384 | 38400bps |

Set data bit and parity bit.

| Display | biT2 | |
|---|---|---|
| | Data bit | Parity |
| 8o | 8 | Odd |
| 8E | 8 | Even |
| 8n | 8 | None |

· Selected parameters are not enabled unless the power is turned on again. Be sure to reset the instrument or turn on the power again.

[Setting example] Setting data length 8o to 8E

| Display | Operation procedure |
|---|---|
| <br>Operation display | 1. Check that the operation display is shown. |
| <br>Channel selection display | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  <br>Channel selection display | 3. Press the ▽ key to display b CoN. |
|  <br>Parameter selection display | 4. Press the SEL or the ▷ key, and b.SrN4 appears and the parameter selection display is shown. |
|  <br>Parameter selection display | 5. Press the ▽ key to display b.bCr2. |
|  <br>Setting change mode | 6. Press the SEL or the ▷ key to make the setting flicker, and set the value to 8E using the ▷, △, or the ▽ key. |
|  <br>Parameter selection display | 7. Press the SEL key to register the setting. |
|  <br>Operation display | 8. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

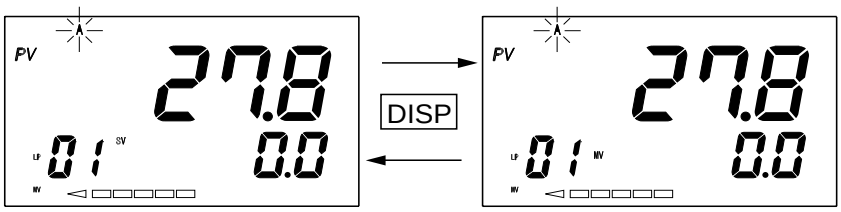
# 4 OPERATION

## Operation mode

This instrument can be operated in Auto, Remote, or Manual mode.
Operation method of each mode, operation display, and operation procedures are described below.

### ● Auto operation

The instrument is automatically operated with the target settings set in the controller.
Target settings can be set on the front panel or with communication.



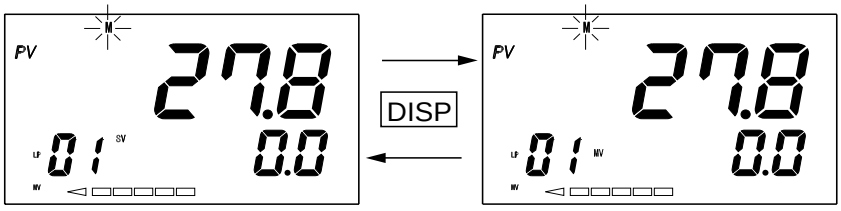

[Mode indicator]
A lights
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays set value (SV).
[SV/MV operation]
Settings can be changed on the front panel.

[Mode indicator]
A lights
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays operation output (MV).
[SV/MV operation]
Operation output cannot be changed on the front panel.

* See 4-1 “Auto operation” for details of auto operation procedures.

### ● Manual operation

An operator manually changes operation output (MV) to operate the instrument.



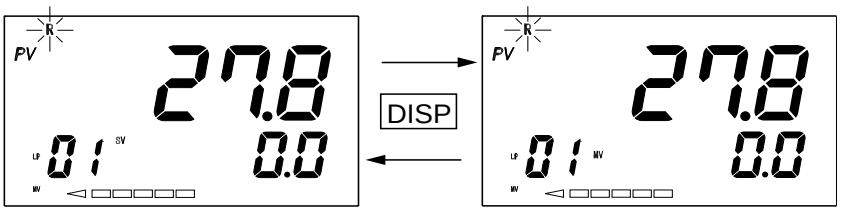

[Mode indicator]
M lights
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays set value (SV).
[SV/MV operation]
Settings can be changed in local mode.

[Mode indicator]
M lights
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays operation output (MV).
[SV/MV operation]
Settings can be changed on the front panel.

* See 4-2 “Manual operation” for details of manual operation procedures.

● Remote operation

Operation is performed with auxiliary input Ail or the setting of SV selection (SV selection PID control) used as target setting.



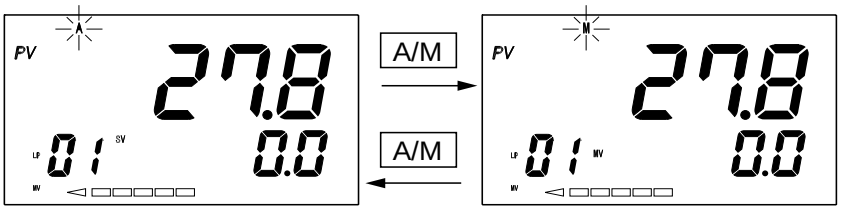

[Mode indicator]
R lights on.
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays auxiliary input Ail or target setting of SV selection PID control.
[SV/MV operation]
Target settings cannot be changed.

[Mode indicator]
R lights on.
[PV indicator]
Displays measurement value (PV).
[SV/MV indicator]
Displays operation output (MV).
[SV/MV operation]
Settings can be changed on the front panel.

* See 4-3 “Remote operation” for details of remote operation procedures.

■ Change between Auto and Manual mode

Changing method: Operation mode can be changed between Auto and Manual using the A/M key on the operation display.
(See 4-2 “Manual operation” for detailed operation procedures.)




Related functions: [1] Prohibition of change to manual operation: Change to manual operation can be prohibited with A-M parameter. (See 5-17 “Setting manual operation prohibition” for details.
[2] Operation mode can be switched to Manual by manual command signal with Di input.
(See 5-10 “Digital input (Di) function” for details.)

Note: Change both from Auto to Manual and Manual to Auto is balanceless bumpless transfer.

■ Change between Auto and Remote operations

Changing method : [1] Operation mode can be changed between Auto and Remote with rEM1 (Ch1-1). (See 4-3 “Remote operation” for detailed operation procedures.)

[2] Operation mode can be changed between Auto and Remote by operating the dSV key. (See 5-13 “Keys allocated by users” for details.)

[3] The operation mode is automatically changed to Remote by performing SV switching at the time of SV selection PID control.

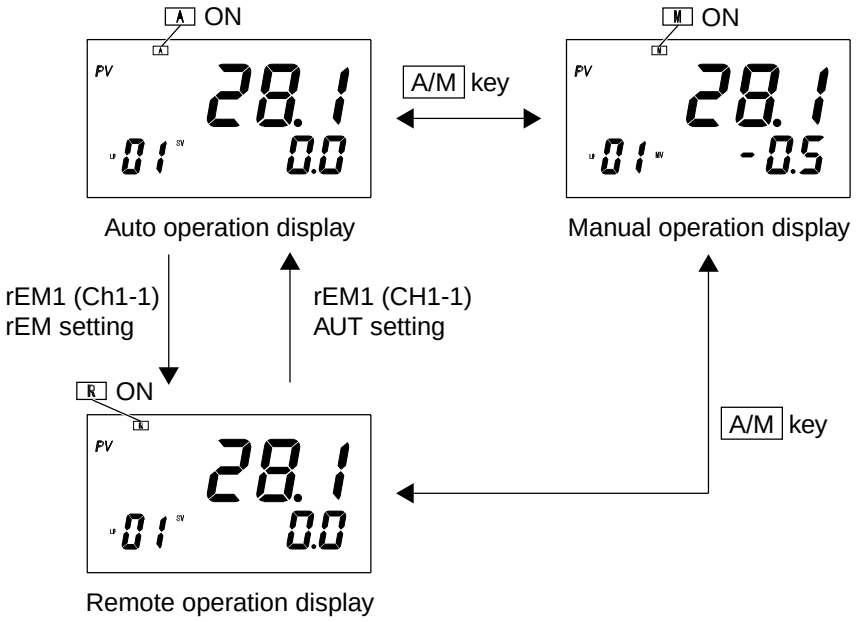
Related functions: [1] Remote operation prohibition function: Remote operation can be prohibited with rihl (Ch9-7) parameter.

[2] Changing with R-ACK signal: The operation mode can be changed to Remote with R-ACK signal from outside with rAC1 (Ch9-11) setting. (See 5-16 “R-ACK function” for details of R-ACK function.)

Note: Change from Remote to Local: Provision of tracking function can be selected with Trk1 (Ch9-23).
Balanceless bumpless transfer when TrK=On
Balance bumpless transfer when TrK=Off

Change from Local to Remote: Balance bumpless transfer
(Balance remote SV and local SV while watching dSV display before changing modes.)

## Flow of operation mode change



# 4-1 Auto operation

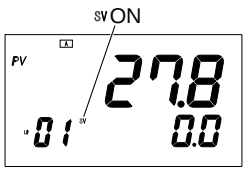
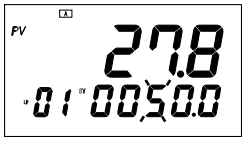
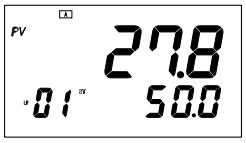
[Description]

Set value (SV) can be set on the front panel, and the result of PID operation can be output as operation output (MV), which is called "Auto operation."

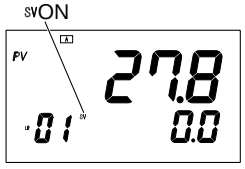
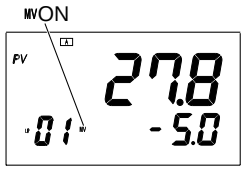
The [A] lamp is kept on during auto operation.

The SV during auto operation is called local SV.

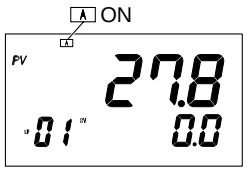
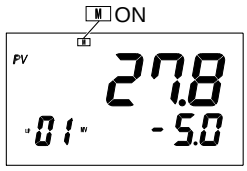
## Changing SV

| Display | Operation procedure |
|---|---|
|  Operation display | **Changing SV**<br>1. Check that the SV of the SV/MV lamp lights on the operation display. |
| | 2. Press the [△] key, and the value of the digit at the far right increases.<br>Press the [▽] key, and the value of the digit at the far right decreases.<br>The SV value is immediately reflected in this case. |
| Setting change mode | 3. Press the [▷] key, and the digit at the far right of the SV starts flickering. Press the [▷] key again while it is flickering, and you can move to the digit you want to make a change. |
|  | 4. When flickering moves to the digit you want to make a change, change the setting by pressing the [△] and [▽] keys. |
|  Operation display | 5. Press the [SEL] key, and the change of SV is completed, and the setting is reflected. |

## Displaying operation output (MV)

| Display | Operation procedure |
|---|---|
|  Operation display  | —Displaying MV<br>1. Check that the SV of the SV/MV lamp lights on the operation display.<br>2. Press the DISP key while the SV lamp is on, and the display changes to MV display.<br>(Press the DISP key again to return to the SV display operation screen.) |

## Changing from Auto (A) operation to Manual (M) operation

| Display | Operation procedure |
|---|---|
|  Operation display  | 1. Check that the A lights on the operation display.<br>2. Press the A/M key while the A lamp is on, and the M lamp comes on, and the operation mode is changed to Manual.<br>(Press the A/M key to return to Auto operation.) |

Note: The operation output (MV) value immediately before the change to Manual operation is displayed when operation mode is changed from Auto to Manual.
The MV value is kept output until the MV value is changed.

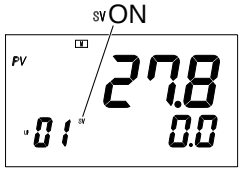
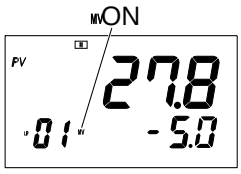
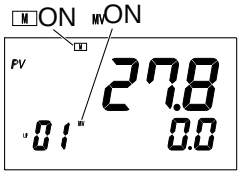
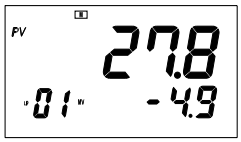
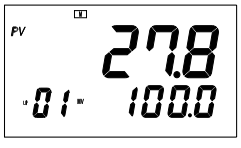
# 4-2 Manual operation

[Description]

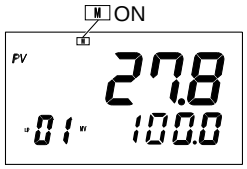
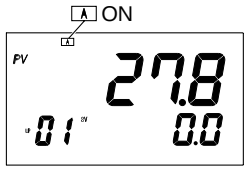
Operation output (MV) can be directly operated by an operator, which is called “Manual operation.” (Setting unit is %.)

The [ M ] lamp lights on during manual operation.

## Displaying operation output (MV)

| Display | Operation procedure |
|---|---|
|  Operation display | —Displaying MV— |
|  | 1. Check that SV of the SV/MV lamp lights on the operation display. |
|  Operation display | 2. Press the [DISP] key while the SV lamp is kept on, and the display changes to MV display.<br>(Press the [DISP] key again to return to the SV display screen.) |
|  | —Changing MV— |
| Setting change mode | 1. Check that the MV lamp and [ M ] light on the operation display. |
| | 2. Press the [△] key, and the value of the digit at the far right increases.<br>Press the [▽] key, and the value of the digit at the far right decreases.<br>The MV value is immediately reflected in this case.<br>Pressing the [△] key or the [▽] key for 3 seconds accelerates the increase or the decrease. |
|  Operation display | 3. Press the [▷] key, and the digit at the far right of the MV value starts flickering. Press the [▷] again while it is flickering, and you can move to the digit you want to make a change. |
| | 4. When flickering moves to the digit you want to make a change, change the setting by pressing the [△] and the [▽] keys. |
| | 5. Press the [SEL] key, and the change of MV is completed, and the setting is reflected. |

## Changing from Manual (M) to Auto (A) operation

| Display | Operation procedure |
|---|---|
|  Operation display  | 1. Check that the [M] lamp lights on the operation display.<br><br>2. Press the [A/M] key while the [M] lamp is kept on, and the [A] lamp starts flickering and the operation mode is changed to Auto.<br>(Press the [A/M] key again to return to Manual operation.) |

# 4-3 Remote operation (SV=Auxiliary input Ai1)

**rEM1** Changing setting of Remote/Auto operation (Setting range: REM, AUT)

[Description]

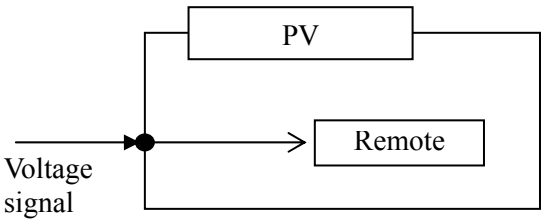
This instrument can be operated either in "Auto operation" mode, in which SV is set using the keys on the front panel, or "Remote operation" mode, in which SV is set with external settings (remote SV) set by analog auxiliary Ai input signals or SV selection method (see 4-4 "SV selection function (Remote operation)").
Change to remote operation mode (SV=Auxiliary input Ai1) can also be made using the keys allocated by users, or Di remote acknowledge signals (R-ACK).
This parameter cannot be set when remote operation in SV selection method is used.

* See 5-16 "R-ACK function" for details of R-ACK.
* See 5-13 "Keys allocated by users" for details of the keys allocated by users.

To operate the instrument in Remote mode (SV=Auxiliary input Ai1), set the control template (TPLT (Ch8-92)) to "10" or "13."

Note: Remote operation can be performed only when "1" is selected for the 7th digit of the code symbols.

· With this function, voltage signals are input to auxiliary input Ai to control SV.

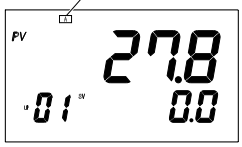
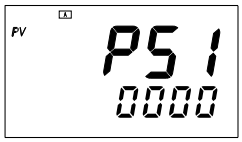
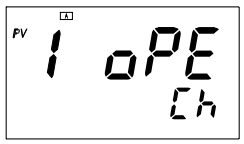
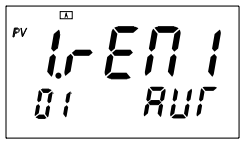
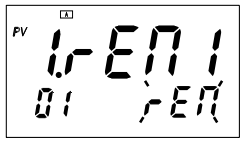
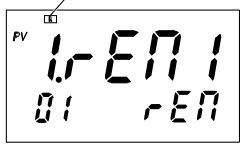
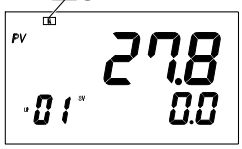



・ To perform remote operation

(1) Set Ai1F, Ai1B, and Ai1D to the same value as PV1F, PV1B, and PV1D.
(If PV1 input scale setting and Ai input scale setting do not coincide, the value of Ch7Ai1 monitor and remote SV are not the same.)
(2) Set Ai1T to the voltage range to be input.
(3) Connect the voltage signal for remote SV in the range set to Ch8Ai1 to the auxiliary input terminal (Ai1).
(4) Perform zero point adjustment and span point adjustment of remote SV input as required.
Ch8 SET parameter
Ai1Z: Parameter for zero point adjustment of remote SV input
Ai1S: Parameter for span point adjustment of remote SV input
(5) Change ch1 REM1 parameter from AUT to REM, and the mode is changed to remote SV operation mode.
(Change can also be made by allocating the function to a user key or Di.)

* Ch8 A1TF is the setting for remote SV input filter. Keep the setting to 0.0 (factory-set value) unless the change is inevitable.

[Setting example] Changing operation mode from Auto to Remote

| Display | Operation procedure |
|---|---|
| A ON<br>  <br>Operation display | 1. Check that the operation display is shown. |
|  <br>Setting change mode | 2. Press the SEL key, and the channel selection display appears, displaying PS1. |
|  <br>Setting change mode | 3. Press the ▽ key to display 1 oPE. |
|  <br>Parameter selection display | 4. Press the SEL or the ▷ key, and the parameter selection display appears, displaying 1rEN1. |
|  <br>Setting change mode | 5. Press the SEL or the ▷ key to make the setting flicker, and set the value to rEN using the △ or the ▽ key. |
| R ON<br>  <br>Parameter selection display | 6. Press the SEL key to register the setting. |
| R ON<br>  <br>Operation display | 7. Press the DISP key once to return to the parameter selection display. Press it again to return to the operation display. |

Changing from Remote operation to Auto operation

- Follow the same procedure to change the mode from Remote to Auto.
- See 5-19 “SV tracking function” for the SV when the operation mode is changed from Remote to Auto.

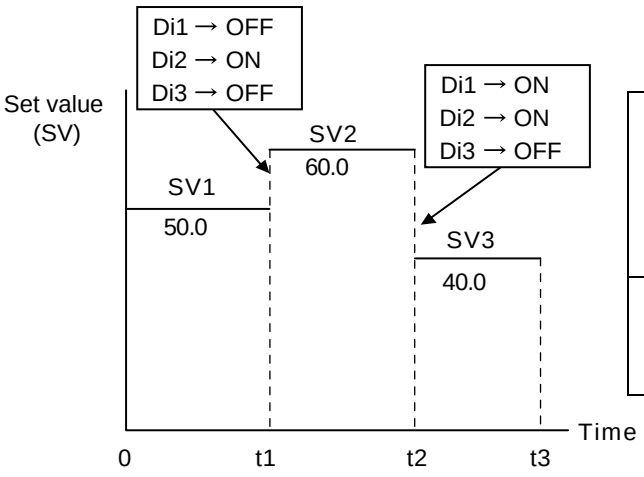
# 4-4 SV selection function (Remote operation)

- Eight kinds of set values (SV), SV1 to 7 of Ch3 PLT and local SV, can be selected and controlled with Di1 to 3, which is called SV selection function.
- Set TPLT (Ch8-92) to "11" or "14" to use the SV selection function.
- Select SV, referring to the following table.

| SV No. | Di1 | Di2 | Di3 |
|---|---|---|---|
| SV (Local set value) | OFF | OFF | OFF |
| SV1 (Remote SV) | ON | OFF | OFF |
| SV2 (Remote SV) | OFF | ON | OFF |
| SV3 (Remote SV) | ON | ON | OFF |
| SV4 (Remote SV) | OFF | OFF | ON |
| SV5 (Remote SV) | ON | OFF | ON |
| SV6 (Remote SV) | OFF | ON | ON |
| SV7 (Remote SV) | ON | ON | ON |

[Note]
Operation is carried out in Remote mode when SV1 to 7 is selected.

[Example]
Set SV1 of Ch3PLT to 50.0, SV2 to 60.0, and SV3 to 40.0, and the operation can be performed according to the settings of SV1 (for 0 to $t_1$), SV2 (for $t_1$ to $t_2$) and SV3 (for $t_2$ to $t_3$).




| | |
|---|---|
| Setting range | −25.0 to 125.0%FS<br>(Engineering value setting against full scale)<br>(Within the range of limiter when the value is set to limiter setting) |
| Factory-set value | 0.0%FS<br>(Engineering value setting against full scale) |

- Set each set value (SV) with Ch3 PLT.
  See 5-19 "SV tracking function" for the SV when the operation mode is changed from Remote to Auto.

# 4-5 Standby function

STBY Standby setting (Setting range: ON, OFF)

STBO Operation setting for standby function (Setting range: 0, 1)

PMV1 Output setting for standby function (Setting range: –25.0 to 105.0%)

[Description]

1) Change between RUN/Standby with STby (Ch1-5).
With standby function, designated MV value is output, while all the outputs except for control output (MV) and communication are turned OFF.

· The STBY lamp is kept on during standby.
(PV and SV display can be turned off with STbo (Ch9-30).

· See the following table for the status of functions during standby.

| | During standby | Upon reset |
|---|---|---|
| Operation output | Outputs value designated by PMv1. | Bumpless reset |
| Alarm output | All outputs are OFF. | — |
| Timer operation | All operations are OFF. | Zero start |
| Hold operation | - | Initial start |
| Latch operation | All operations are OFF. | Initial start |
| Non excitation output operation | All operations are OFF. | Non excitation operation |
| Communication | Not affected by standby status. | |
| Analog re-transmission output | 0mA | |
| Digital output (Do) | All outputs are OFF. | — |
| Digital input (Di) | — | Level detection: Operated<br>Edge detection: Not operated. |
| Control mode | Not affected by standby status. | |
| Display | Can be selected from Display/Non display. | Display |

· Standby setting is maintained even if the power is turned ON/OFF.

· If the instrument is put into standby while auto tuning is carried out, the auto tuning is canceled. PID constant is not updated.

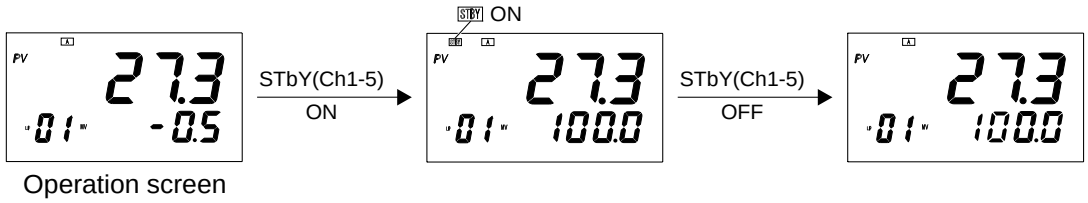
2) Set the operations during standby to STbo.

· See the following table for the operations during standby.

| STBY | STBO | Operation during standby | | |
|---|---|---|---|---|
| | | MV output | Output other than MV | Screen display |
| ON | 0 | Value of PMV1 (Ch2-22) (–25% to 125%) | OFF or –25% | ON |
| | 1 | Value of PMV1 (Ch2-22) (–25% to 125%) | OFF or –25% | OFF |
| OFF | — | Normal | Normal | ON |

3) Set the output value (MV) during control standby to PMV1 (Ch2-22).
The set value is output during standby.
On setting standby to OFF, the instrument is reset bumplessly.

Example: When PMv1 (Ch2-22) is set to 100.0

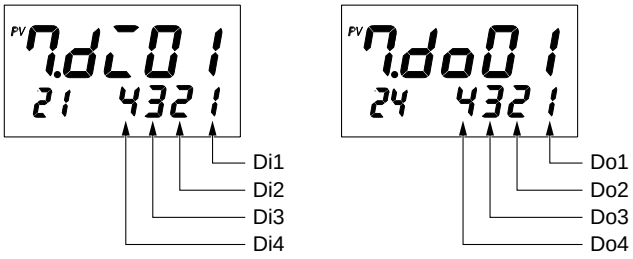



Operation screen

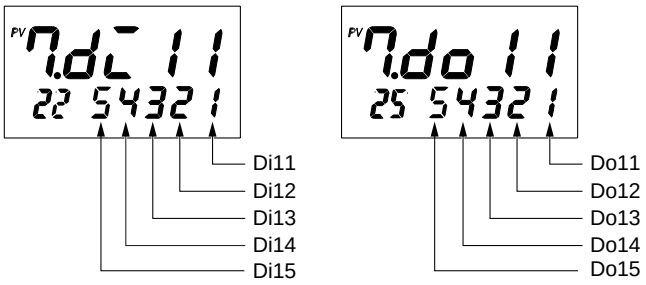
# 4-6 How to use monitoring function

- Monitoring: Input/output value can be checked with the monitoring function.
- The monitor exists in Ch7 Mon. See the appended parameter list.

Di and Do are displayed as shown below.




When the value is kept on: ON
When the value is kept off: OFF




When the value is kept on: ON
When the value is kept off: OFF

Ao1, Ao2, AMv1 and FFv1 are in unit of %.
The unit for TM1 to 8 is changed between seconds and minutes according to the alarm option setting.

[Note]
Setting of monitors cannot be changed.

# 5 ADVANCED USAGE

## 5-1 Setting inputs

| | |
|---|---|
| P 1CU | PV1 input rooter/cut point (Setting range: OFF, 0.0 to 125.0%) |
| P 1FF | PV1 input filter time constant (Setting range: 0.0 to 900.0 seconds) |

[Description]

**1) P1CU(Ch8-11）**

Square root extraction

· To convert differential pressure to flow rate, use square root extraction.
Where differential pressure is small, the flow rate to the set router cut point is handled as “0” to prevent the flow rate from being changed greatly and becoming unstable by noise.

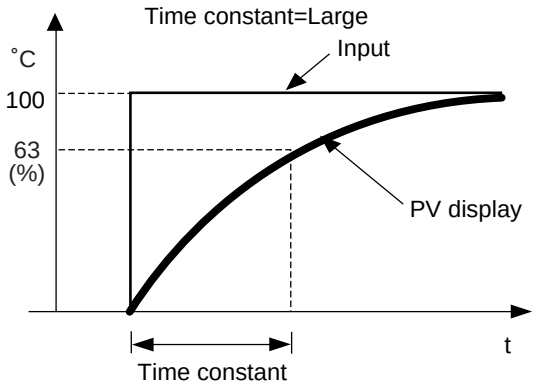
· To use square root extraction for PV2 and Ai1, make the setting for P2CU (Ch8-24) and A1CU (Ch8-49) in the same way.

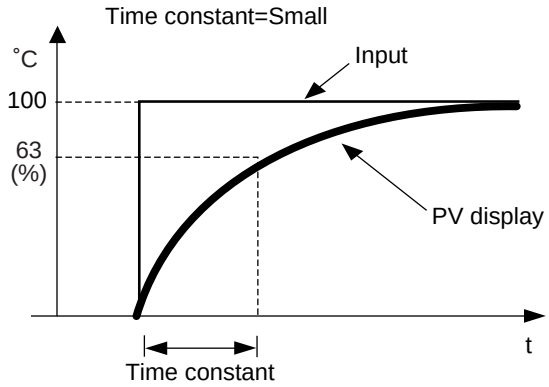
**2) P1TF（Ch8-12）**

Input filter

Fluctuation of measurement value by noise, etc. can be suppressed by input filter.
When the value of P1 (Ch2-1) (proportional band) is small, even a small change of PV makes the MV value fluctuate greatly. Control can be stabilized by filtering in such cases.
The filter of this instrument is first-order lag filter.
If the input filter time constant P1TF is set to 5.0, the PV display gradually changes when input is suddenly changed from 0 to 100% as shown by the following figure, and it takes 5 seconds for the value to change from 0 to 63.2%.
The larger the value of the filter time constant, the stronger the effect of the filter.

| | | |
|---|---|---|
| Small← | Time constant→ | Large |
| Fast← | Response→ | Slow |
| Weak← | Effect→ | Strong |




To use the filter for PV2 and Ai1, make the setting for P2TF (Ch8-25) and A1TF (Ch8-50) in the same way.

# 5-2 Setting output

| | |
|---|---|
| MVH1 | Upper limit value of operation output (MV) (Setting range: –25.0 to 125.0%FS)) |
| MVL1 | Lower limit value of operation output (MV) (Setting range: –25.0 to 125.0%FS)) |
| dMV1 | Limit value of MV change rate (Setting range: 0.0 to 150.0%) |

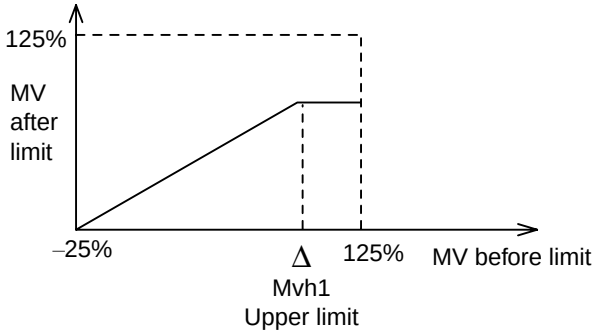
[Description]

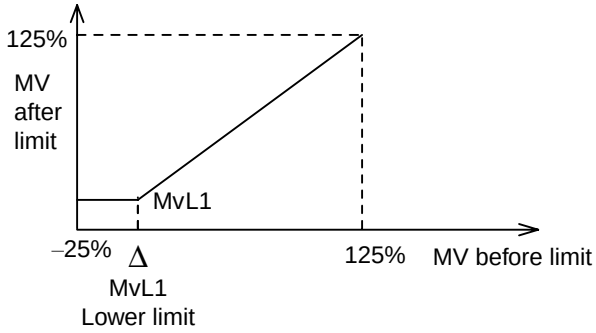
**1) Mvh1 (Ch2-9), MvL1 (Ch2-10)**

- Operation output (MV) limit is used to limit the internal MV value.
- When the MV is limited, P operation and I operation in the direction in which MV deviates from the limit are cut.

[Note]

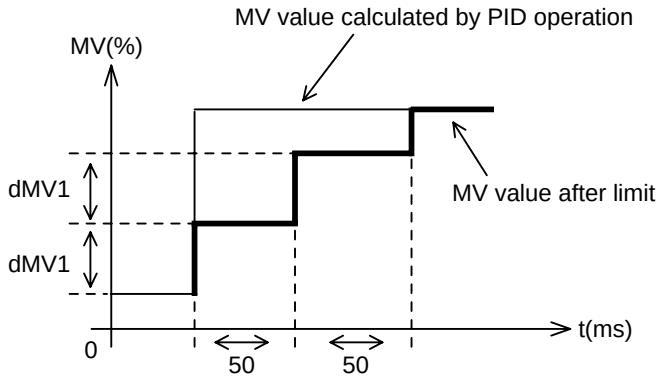
- Neither upper limit nor lower limit functions in the following cases.
  1) During manual operation
  2) During auto tuning
  3) During standby
  4) During EXMV output
  5) During burnout




**2) dMv1 (Ch2-13)**

- Limit value for the change of MV in 1 control cycle (50msec) can be set.
- Setting 0.0 provides no limit.
- Operation output (MV) set manually during manual operation is also limited.



# 5-3 Setting PID

| | |
|---|---|
| P 1 | Proportional band (Setting range: 0.0 to 999.9%) |
| I 1 | Integral action time (Setting range: 0.0 to 3200.0sec) |
| d 1 | Derivative action time (Setting range: 0.0 to 999.9sec) |
| dT 1 | Sampling cycle setting (Setting range: 5 to 1000) |

[Description]

**1) P1 (Ch2-1)**

[Setting method]

- Setting can be made automatically by auto tuning.
- To set manually, select optimum value in the proportional band with this parameter.

[ON/OFF control]

- Set P1 to 0.0 to perform ON/OFF control (2-position control).
- Hysteresis of ON/OFF control can be set with hS1 (Ch2-15).

[Note]

- Generally, if too small value is set to P (proportional band), the control becomes unstable. If too large value is set, on the contrary, reaction becomes slow.
- The instrument is placed under PID control (P≠0) mode, if auto tuning is performed. If the instrument is operated with ON/OFF control, do not perform auto tuning.

**2) I1 (Ch2-2)**

[Setting method]

- Setting can be made automatically by auto tuning.
- To set manually, select optimum integral action time with this parameter.

[Positional P operation]

- If I1 is set to 0.0, integral action is not carried out. Positional P operation is performed instead.

[Note]

- If P1 is set to values other than 0, I1 setting is made invalid.

**3) D1 (Ch2-3)**

[Setting method]

- Setting can be made automatically by auto tuning.
- To set manually, select optimum derivative action time with this parameter.

[Note]

- If D1 is set to 0.0, derivative action is not carried out.
- If P1 is set to values other than 0, D1 setting is made invalid.

**4) dT1 (Ch2-14)**

- Set the cycle of performing control operation (PID operation).

[Note]

- Setting can be made in the unit of 10ms, but operation cycle must be changed in the unit of 50ms.
- (Setting example)
  When dT1=5 to 9, control operation cycle is 50ms.
  When dT1=10 to 14, control operation cycle is 100ms.

# 5-4 Setting hysteresis

hS1 Histeresis width at the time of 2-position operation (Setting range: 0 to 50%FS)

[Description]

**1) hS1 (Ch2-15)**

- To perform ON/OFF control (2-position operation control), set P1 (Ch2-1) to 0.0. i1 (Ch2-2) or d1 (ch2-3) need not be set.
- If the hysteresis width (width of ON/OFF control) is made small, output may be repetitively turned ON/OFF frequently. (In the case of contact output, in particular, it may affect the service life of the operation unit.)
- The unit of the setting of this parameter is engineering value, but the settable range varies depending on the measurement range of the input.

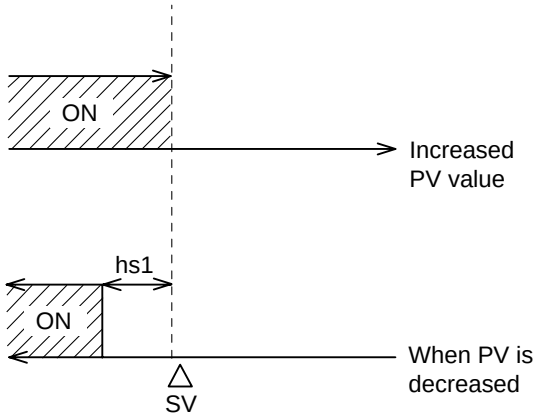
[Example] Input K Thermocouple: When measurement range is 0 to 400°C
Settable range is 0 to 200°C.
Resistance bulb: When measurement range is 0 to 150°C
Settable range is 0 to 75°C.

Example of parameter setting and operation

1) Reverse operation

| Parameter | Set value |
|---|---|
| P1 (Ch2-1) | 0.0 |
| hS1 (Ch2-15) | Arbitrary |
| rEv1 (Ch2-20) | REV |

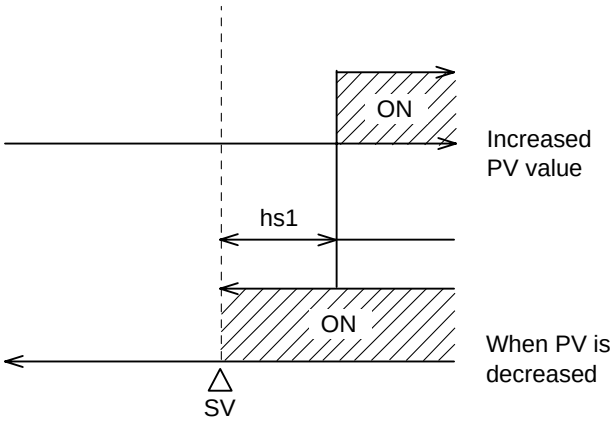
| Relation between PV and SV | Output |
|---|---|
| PV > SV | OFF |
| PV < SV | ON |




2) Normal operation

| Parameter | Set value |
|---|---|
| P1 (Ch2-1) | 0.0 |
| hS1 (Ch2-15) | Arbitrary |
| rEv1 (Ch2-20) | NRML |

| Relation between PV and SV | Output |
|---|---|
| PV > SV | ON |
| PV < SV | OFF |



# 5-5 Setting bAL, Arh, and ArL

bAL 1 Output convergence value (Setting range: −100.0 to 100.0%)

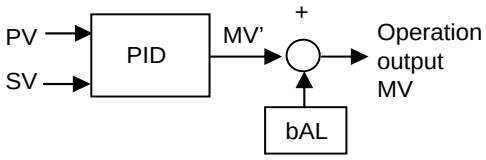
Arh 1 Integration upper limit cut point (Setting range: 0 to 100%FS)

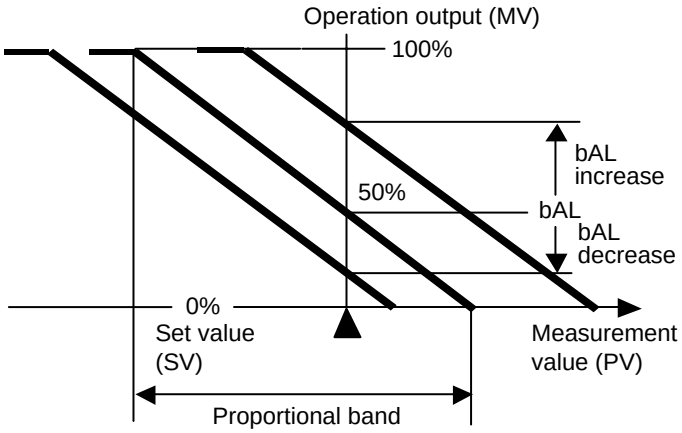
ArL 1 Integration lower limit cut point (Setting range: 0 to 100%FS)

[Description]

**1) bAL1 (Ch2-18)**

· In the case of positional P operation (I=0)
The value of bAL (Ch2-18) is added as offset to the result of PID operation performed with PV and SV, which is regarded as output (MV).

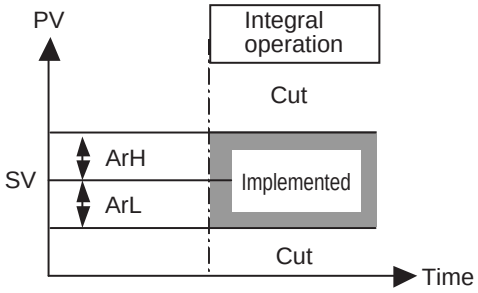



· In the case of speed PID operation (1≠0)
The value set to bAL becomes the operation output value at the time of power ON.

**2) Arh1 (Ch2-5), ArL1 (Ch2-6)**

· The range where integral action is performed is limited.
· Integration is performed within the range SV-ArL≤PV≤SV+Arh.
· Integral action is not carried out outside the range.
· If integral action is included in the control operation, overshoot occurs due to initial excessive integration. To prevent this, the range where integral action is performed is limited.




[Note]

· Arh1 (Ch2-5), ArL1 (Ch2-6) and bAL (Ch2-18) are not automatically set by auto tuning.

# 5-6 Palette function

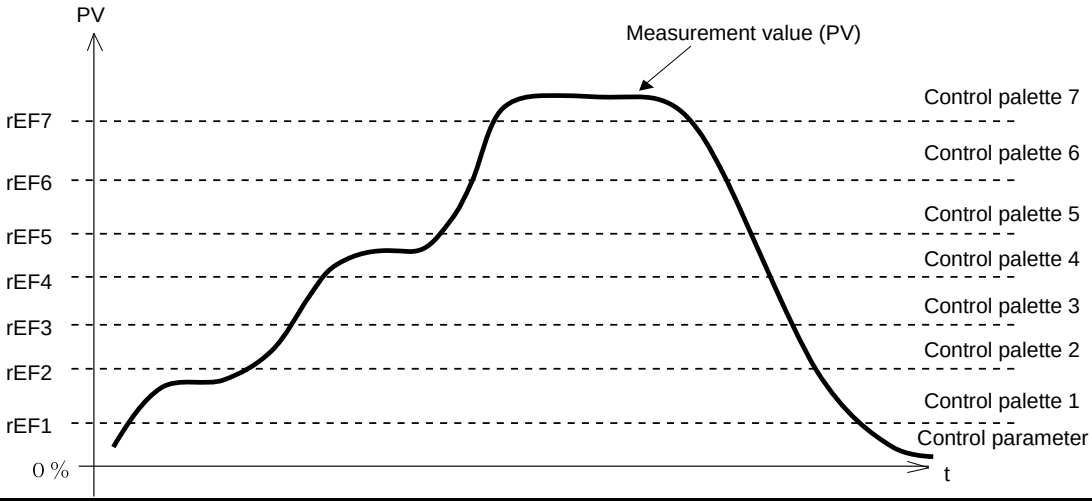
PLTn Palette selection (Setting range: 0 to 7)

PLTS Palette switching method setting (Setting range: PLTn, SV, PV)

[Description]

This instrument is provided with 7 pairs of control palettes (pair of control parameters) at Ch3, in addition to control parameter at Ch2. Control can be made while switching these control palettes.
Select control palette switching method with PLTS parameter.

**1) PLTS (Ch9-31)**

| PLTS setting | Control palette switching method |
|---|---|
| PLTn | Operation is performed with the control palette set at PLTn (Ch1-9).<br>The SV of the control palette being selected becomes the current target set value. |
| SV | This is effective when SV selection type PID control (TPLT=11 or 14) is used.<br>Operation is performed with the control palette of the SV No. selected by Di.<br>See 3-1 “Setting control template” for details of SV selection type PID control. |
| PV | Operation is performed while control palettes are automatically switched depending on the measurement value (PV), with the value set for rEF1 to 7 (Ch3-78 to 84) regarded as threshold.<br>The following figure shows the relation between the PV reference point and the control palettes.<br>  |

**2) PLTn (Ch1-9)**

- When PLTS is set to PLTn, set the No. of control palette used for operation.
- When PLTS is set to SV or PV, No. of control palette currently used for operation is displayed. PLTn parameter cannot be set in this case.

# 5-7 Key lock

LoC Key lock setting (Setting range: 0 to 5)

[Description]

**1) LoC (Ch1-34)**

- Key lock is a function of preventing parameters and set values (SV) from being changed. Note that if the key lock function is made valid, parameters and set values can be displayed.
- Set LoC (Ch1-34) to 0 to reset the key lock function.
- Control operation and alarm operation are performed normally even if the key lock function is made valid.
- The setting of key lock function can be made in the following 6 stages.

| LoC | Key operation | | Communication write | |
|---|---|---|---|---|
| | All parameters | Set value (SV) | All parameters | Set value (SV) |
| 0 | ○ | ○ | ○ | ○ |
| 1 | X | X | ○ | ○ |
| 2 | X | ○ | ○ | ○ |
| 3 | ○ | ○ | X | X |
| 4 | X | X | X | X |
| 5 | X | ○ | X | X |

○:Setting allowed X:Setting not allowed

# 5-8 Setting direction of burnout

brd1 Burnout direction setting (Setting range: HOLD, LO, UP, EXMV)

[Description]

**1) brd1(Ch9-35)**

· Set the value of operation output (MV) at the time of burnout.
Output value can be selected from the following 4 types.

| brd1 | Operation output (MV) at the time of burnout |
|---|---|
| hold | Value of operation output (MV) immediately before burnout |
| LO | –25% |
| UP | 125% |
| EX-MV | EXM1 (Ch2-97) setting |

* See 5-22 “EX-MV function” for details of EXM display (Ch2-97).

Burnout display

| Display | Cause |
|---|---|
| UUUU | 1) Burn out of thermocouple sensor<br>2) Burn out of resistance bulb<br>3) PV reading exceeds upper limit value +5%FS.<br>4) RCJ module is not mounted (thermocouple input). |
| LLLL | 1) LLLL display appears for a moment when resistance bulb sensor (line B) breaks. |

· If even one of the inputs related to mathematical expressions (PV1, PV2, Ai1) burns out when Math function (TPLT (Ch8-92)=10 or 11) is performed, the main unit is brought into burnout state.

* See 5-14 “Math function” for details of Math function.
* See 3-1 “Setting control template” for details of control templates.

# 5-9 User adjustment

| PV1Z | Zero adjustment value setting of PV1 input (Setting range: –50% to 50%) |
|---|---|

| PV1S | Span adjustment value setting of PV1 input (Setting range: –50% to 50%) |
|---|---|

[Description]

**PV1Z (Ch8-6), PV1S (Ch8-7)**

· User calibration function is independent of the adjusted value of the controller main unit. If 0 is set to this parameter, factory-set status can be restored.

1) Before starting calibration using this parameter, provide the following devices.
   · Generator
   1 to 5V (For voltage input)
   0 to 100mV (For thermocouple)
   0 to 100mA (For current input)
   · Dial resistor
   100.0 to 400.0Ω (For resistance bulb input)
2) Apply input equivalent to 0°C.
   If the margin of error is so large that intended accuracy cannot be maintained, set PV1Z (Ch8-6).
   (See the following example for setting method.)
3) Apply input equivalent to 100°C.
   If the margin of error is so large that intended accuracy cannot be maintained, set PV1S (Ch8-7).
   (See the following example for setting method.)

[Example of operation for input range of 0 to 400°C]

If PV1Z and PV1S are set to 1 and –2 respectively under the following conditions,

Reading at 0°C input : –1°C
Reading at 400°C input : 402°C
PV1Z=1, PV1S=–2

the reading becomes as follows:

Reading at 0°C input : 0°C
Reading at 400°C input : 400°C

[Example of adjustment for input range of 0 to 400°C]

| Before adjustment | Adjusted value | After adjustment |
|---|---|---|
| Reading at 0°C input: –1°C | PV1Z: 1 | Reading at 0°C input: 0°C |
| Reading at 400°C input: 402°C | PV1S: –2 | Reading at 400°C input: 400°C |

If 0 is set both to PV1Z and PV1S parameters, factory-set calibration status is restored.

[Note]

· Check the value of each input with Ch7 MON (monitor).
  To adjust thermocouple input, set parameter rCJ1 to OFF before performing operation in [2], and when the operation in [3] is completed, set it to ON again.
  See 5-21 “Setting parameter mask” for procedure of displaying parameter rCJ.
  rCJ1 display mask=20-6
  rCJ2 display mask=21-6

· To use it as input offset, set the same value to PV1Z and PV1S. Shift is made by the set value.
· To adjust PV2, set PV2Z (Ch8-19) and PV2S (Ch8-20).
  To adjust Ai1, set Ai1Z (Ch8-45) and Ai1S (Ch8-46).

# 5-10 Digital input (Di) function

dI01 to dI04
dI11 to dI15
} Di operation setting (Setting range: 0 to 255)

[Description]

**di01 (Ch9-39) to di04 (Ch9-42)**
**di11 (Ch9-43) to di15 (Ch9-47)** [9 digital input point specifications only]

Select each Di function with Di setting parameter, and set Di to ON to operate.

| Di1 to Di15 setting | Function | Operation Conditions | | | |
|---|---|---|---|---|---|
| | | Status | | Edge | |
| | | ON | OFF | ↑ ON | ↓ OFF |
| 0 | None | — | — | — | — |
| 1 | STBY (standby) | Standby | Normal | — | — |
| 30 | AT (Auto tuning) | — | — | AT start | AT stop |
| 40 | Alarm latch reset<br>(Alarm 1) to (Alarm 8)<br>Release all | — | — | Release all | Latch hold |
| 50 to 57 | Timer operation<br>(Alarm 1) to (Alarm 8) | ON | OFF | — | — |
| 60 | R-ACK<br>(Remote acknowledge) | Remote | Local | — | — |
| 70 | SMV<br>(Manual command) | Manual mode | Auto mode | — | — |
| 80 | PV-TRK command<br>(PV tracking) | ON | OFF | — | — |
| 103 | EX-MV<br>(External output value) | EX-MV | MV | — | — |
| 200 to 209 | Binary data setting to constant parameter CN01<br>200: Setting of the 1st bit of CN01<br>201: Setting of the 2nd bit of CN01<br>209: Setting of the 10th bit of CN01 | 1 | 0 | — | — |
| 210 to 249 | Binary data setting to constant parameters CN02 to CN05 | 1 | 0 | — | — |

1) Switching between control RUN and Standby (Di setting=1)
   · Switching can be done between control RUN and Standby with Di.
   ON: Standby
   OFF: Normal (operation)
2) Auto tuning start (AT) (Di setting=30)
   · Switching can be done between Start and Stop of auto tuning.

| Auto tuning type | Di | |
|---|---|---|
| | ↑ ON | ↓ OFF |
| Normal (NRML) | AT start | AT stop |
| Low PV type (LPV) | | |

* Type of auto tuning (NRML, LPV) must be selected with ATP1 (ChE-1) beforehand.

3) Alarm latch reset (Di setting=40)

· The latch engaged can be released with alarm latch function.

| Di setting | Di | |
|---|---|---|
| | ON | OFF |
| 40 | Latch batch release | Latch hold |

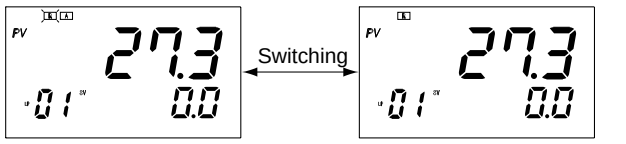
4) Timer operation (Di setting=50 to 57)

· When the code is set to 36 to 38 with alarm type setting, timer ON/OFF can be selected. See 3-8 "Alarm function" for details of operation.
ON: Timer operation ON, OFF:Timer operation OFF

| Di Setting | Timer operation |
|---|---|
| 50 | ALM1 |
| 51 | ALM2 |
| 52 | ALM3 |
| 53 | ALM4 |
| 54 | ALM5 |
| 55 | ALM6 |
| 56 | ALM7 |
| 57 | ALM8 |

5) R-ACK (Remote acknowledge) (Di setting=60)

· Switching between Auto and Remote can be done with Di.
· Set TPLT (Ch8-92) to 10 or 13, rAC1 (Ch9-11) to EnA, and rEM1 (Ch1-1) to rEM, and switching with Di is allowed.



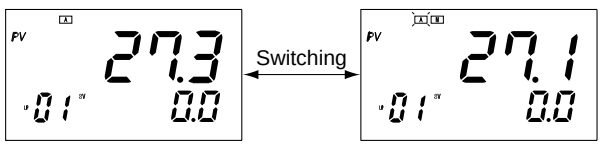

Di1 = OFF
"Auto operation"
The R lamp flickers.
The A lamp comes ON.

Di1 = ON
"Remote operation"
The R lamp comes ON.

* After changing TPLT (Ch8-92) setting, be sure to reset the instrument or turn on the power again.
* See 5-16 "Remote acknowledge (R-ACK) function" for details of R-ACK (remote acknowledge).

6) SMV (Manual command) (Di setting=70)

· Switching between Auto and Manual operation can be done with Di.
· Set TPLT (Ch8-92) to 10 or 13, and set Di to ON or OFF to perform switching. (See the following figure.)



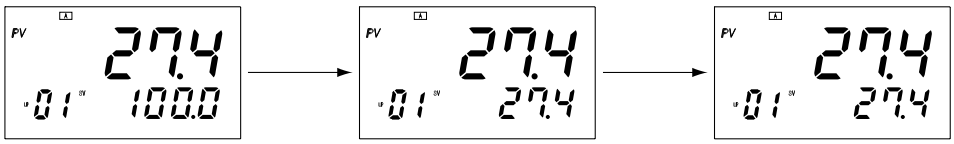

Di2 = OFF
"Auto operation"
The A lamp comes ON.

Di2 = ON
"Manual operation"
The A lamp flickers
The M lamp comes ON.

* After changing TPLT (Ch8-92) setting, be sure to reset the instrument or turn on the power again.

7) PV tracking (Di setting=80)

- SV value can be tracked to PV value.
- Select one Di from Di 1 to 4 or Di 11 to 15, and set it to “80.”
- Set the selected Di to ON or OFF to perform switching.




Di = OFF
"SV: 100.0"

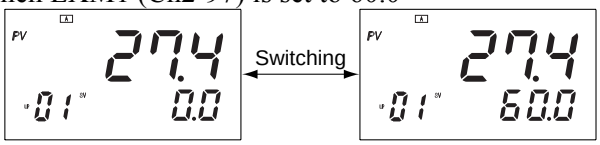
Di = ON
"SV: 27.4"

Di = OFF
"SV: 27.4"

8) EX-MV (Di setting=103)

- Switching between MV (operation output) and EX-MV (external output) can be done with Di.
- Set Di to OFF to select MV, and set it to ON to select EX-MV.

When EXM1 (Ch2-97) is set to 60.0




Di1 = OFF
"MV"

Di1 = ON
"EX-MV"

* See 5-22 “EX-MV function” for details of EX-MV.

# 5-11 Digital output (Do) function

do 1 to do4

do 11 to do 15

[Description]

**1) do1(Ch9-53) to do4(Ch9-56)**
**do11 (Ch9-57) to do15 (Ch9-61)** (9 digital output point specifications only)

- Select signals to be output to digital output (Do).
- Do is output even if the input value is burnt out.
- If OTYP (Ch8-93) is set to 11 or 13, and MV is allocated, priority is given to MV. See the following table for the setting.

| Do Setting | Output signal |
|---|---|
| 0 | No setting |
| 1 | ALM1 |
| 2 | ALM2 |
| 3 | ALM3 |
| 4 | ALM4 |
| 5 | ALM5 |
| 6 | ALM6 |
| 7 | ALM7 |
| 8 | ALM8 |
| 17 | OR ALM |
| 29 | System fault |
| 80 | Manual MV |
| 81 | EX-MV command |
| 82 | Remote SV |
| 83 | Local SV |
| 84 | PV tracking |
| 85 | NORMAL operating |
| 86 | Auto tuning (AT) |
| 87 | Remote request |
| 88 | Remote ACK (R-Ack) |
| 89 | NOT-A |

# 5-12 Setting LED allocation

C1 , C2

Ldo1 to Ldo5

} LED allocation setting (Setting range: 0 to 255)

[Description]

**1) C1(Ch9-67), C2(Ch9-68)**
**Ldo1(Ch9-69) to Ldo5(Ch9 to 73)**

· Make the setting to change signals to be output to the lamp on the front face.
· See the following table for the setting.

| C1,C2<br>Ldo1 to Ldo5 | Type |
|---|---|
| 0 | No setting |
| 1 | ALM1 |
| 2 | ALM2 |
| 3 | ALM3 |
| 4 | ALM4 |
| 5 | ALM5 |
| 6 | ALM6 |
| 7 | ALM7 |
| 8 | ALM8 |
| 17 | OR ALM |
| 21 | Output (MV) 1 |
| 22 | Output (MV) 2 |
| 29 | System fault |
| 80 | Manual MV |
| 81 | EX-MV command |
| 82 | Remote SV |
| 83 | Local SV |
| 84 | PV tracking |
| 85 | NORMAL operating |
| 86 | Auto tuning (AT) |
| 87 | Remote request |
| 88 | Remote ACK (R-Ack) |
| 89 | NOT-A |

[Note]

· The lamp does not come ON when current C1 or C2 is output.

# 5-13 Keys allocated by users

F1 to F3 User key allocation setting (Setting range: 0 to 27)

[Description]

**F1(Ch9-32) to F3(Ch9-34)**

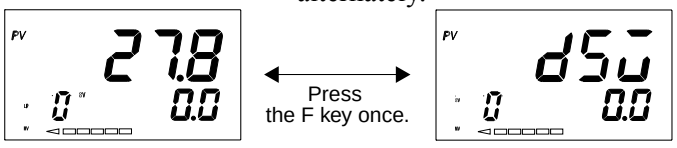
· Functions listed in the following table can be allocated to the F1, F2, and the F3 keys.
The F1, F2, and the F3 keys are hereafter referred to as F key.

| F key setting (Function key code) | Key operation |
|---|---|
| 0 | No function |
| 1 | DSV display<br>Switching between Remote and Auto (Press for 2 seconds.) Note 1 |
| 2 | Standby switching |
| 3 | Alarm latch clear |
| 10 | AT (Auto tuning) START/STOP |
| 20 | Alarm time start/stop (ALM 1) |
| 21 | Alarm time start/stop (ALM 2) |
| 22 | Alarm time start/stop (ALM 3) |
| 23 | Alarm time start/stop (ALM 4) |
| 24 | Alarm time start/stop (ALM 5) |
| 25 | Alarm time start/stop (ALM 6) |
| 26 | Alarm time start/stop (ALM 7) |
| 27 | Alarm time start/stop (ALM 8) |

Note 1: Do not use the setting when TPLT is set to 11 or 14.

1) dsv display Remote/Auto switching (Function key code=1)

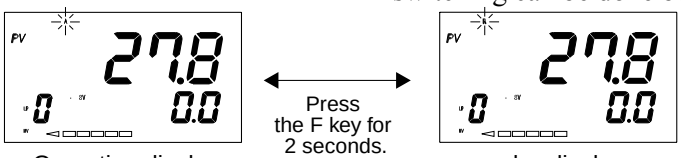
Press the F key once. : By pressing the F key once on the operation display, the dSV display and the PV/SV operation display (or PV/MV operation display) can be displayed alternately.




Operation display dsv display

Note: Switching between the operation display and the dsv display can be done both in auto and remote operation modes.

Press the F key for 2 seconds. : By pressing down the F key for 2 seconds on the operation display, switching can be done between Remote and Auto operations.




Operation display dsv display

· How to use the dSV display
Use the dSV display to balance the remote SV and the local SV when switching operation mode from Auto to Remote.
(When operation is switched from Remote to Auto, the set value (SV) is automatically balanced.)

dSV value = Setting of the controller (local SV) −Externally set signal (auxiliary Ai signal)

[Use example]

Operation mode = Auto
Local SV = 50.0°C
Remote SV = 200.0°C
dsv = −150.0°C ( =50.0°C − 200.0°C) is displayed.

Procedure 1: Press the F key once to show the dsv display.

Procedure 2: Using the ▶, ▲, and the ▼ key, change the value of dsv from −150.0 to 0.0.
(When dsv is set 0.0, the local SV becomes equal to the remote SV.)

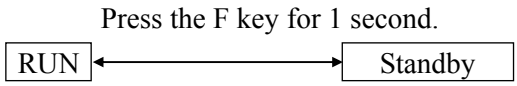
Procedure 3: Press down the F key for 2 seconds to switch operation from Auto to Remote.
(The controller is operated with the remote SV (externally set signal) regarded as target set value.)

[Note]

- If the operation cannot be switched from Auto to Remote by following the procedures shown above, check rAC parameter. See 5-16 “Remote acknowledge (R-ACK) function” for details of rAC parameter.
- If the set value (SV) cannot be automatically balanced when operation is switched from Remote to Auto, check Trk1 parameter.
  See 5-19 “SV tracking function” for details of Trk1 parameter.

2) Standby switching (Function key code=2)

- Control can be switched between RUN and Standby with the F key.
- Press the F key for 1 second to switch.




* See 4-5 “Standby function” for details of standby function.

3) Alarm latch clear (Function key code=3)

- The latch engaged can be released with alarm latch function.

4) Auto tuning (AT) (Function key code=10)

- Auto tuning start and stop can be switched.

| Type of auto tuning | F key ⟷ F key | |
|---|---|---|
| Standard<br>Low PV | AT start | AT stop |

* See 3-7 “AT (Auto tuning)” for details of auto tuning (AT).

5) Alarm timer (Function key code=20 to 27)

- When alarm type code is set to 36 to 38 with alarm function, timer ON/OFF can be selected. See 3-8 “Alarm function” for details of timer operation.

# 5-14 Math function

CALC Math function type setting (Setting range: 0 to 11)

UCF1 Scale of Math function on the full side

UCb1 Scale of Math function on the base side

} (Setting range: –19999 to 99999)

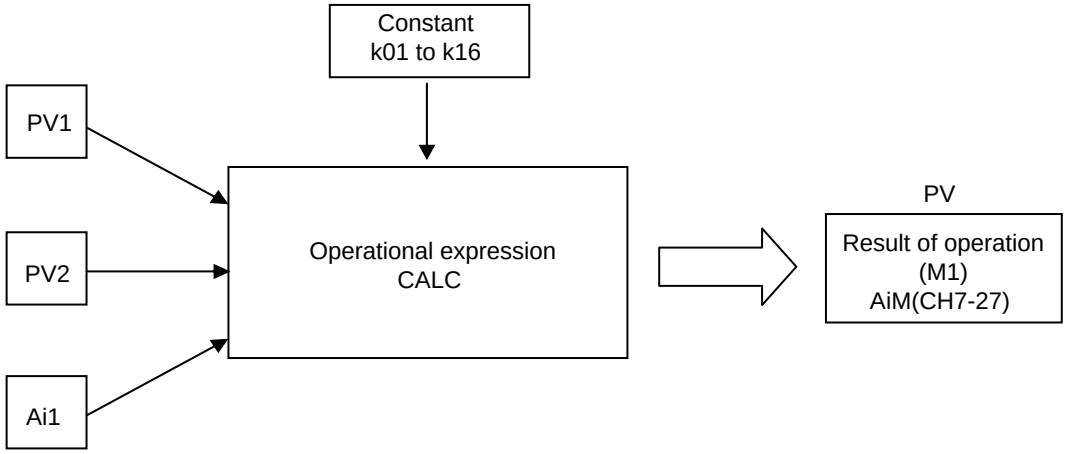
UCd1 Decimal point position of Math function (Setting range: 0 to 3)

t01 to t16 The constant for expression (Setting range: –9999 to 99999)

[Description]

What is Math function?

By substituting arbitrary values into input value (PV1, PV2, Ai1) and constant (k01 (ChD-1) to k16 (ChD-16)), the result of operation M1 can be used as PV, which is called Math function. (See the following figure.)




Set the control template TPLT (Ch8-92) to 10 or 11 to use Math function.

**1) CALC (Ch8-88）**

· Select the type of Math function.
· There are 11 types of Math function. (See the following table.)

| CALC | Name of operation | Math function |
|---|---|---|
| 0 | No operation | PV1<br>M1=PV1 input |
| 1 | Expression 1 (Flow rate compensation calculation) | $M1 = k01 \times \sqrt{PV1}^{*1} \times \sqrt{\frac{Ai1 + k02}{k03} \times \frac{k04}{PV2 + k05}}^{*2}$<br>PV1: Flow rate (Differential pressure), PV2: Temperature, Ai1: Pressure |
| 2 | Expression 2 (Flow rate compensation calculation) | $M1 = k01 \times PV1^{*1} \times \sqrt{\frac{Ai1 + k02}{k03} \times \frac{k04}{PV2 + k05}}$<br>PV1: Flow rate (Differential pressure), PV2: Temperature, Ai1: Pressure |
| 3 | Expression 3 (Flow rate compensation calculation) | $M1 = k01 \times PV1 \times \frac{Ai1 + k02}{k03} \times \frac{k04}{PV2 + k05}$<br>PV1: Flow rate (Differential pressure), PV2: Temperature, Ai1: Pressure |
| 4 | Expression 4 | $M1 = \frac{(k01 \times (k02 \times PV1 + k03 \times PV2 + k04 \times Ai1) + k05)}{(k06 \times (k07 \times PV1 + k08 \times PV2 + k09 \times Ai1) + k10)}$ |
| 5 | Expression 5 | $M1 = \frac{(k01 \times ((k02 \times PV1 + k03) \times (k04 \times PV2 + k05) \times (k06 \times Ai1 + k07)) + k08)}{(k09 \times ((k10 \times PV1 + k11) \times (k12 \times PV2 + k13) \times (k14 \times Ai1 + k15)) + k16)}$ |
| 6 | Expression 6 | $M1 = k01 \times PV1 \times (k02 \times PV2 + k03 \times Ai1) + k04 \times Ai1 + k05$ |
| 7 | H selector, 2 points | M1 =Max (PV1, PV2)<br>Use either PV1 or PV2 input, whichever is larger, as PV. |
| 8 | L selector, 2 points | M1 =Min (PV1, PV2)<br>Use either PV1 or PV2 input, whichever is smaller, as PV. |
| 9 | H selector, 3 points | M1 =Max (PV1, PV2, Ai1)<br>Use one out of PV1, PV2, or Ai1 input, whichever is the largest, as PV. |
| 10 | L selector, 3 points | M1 =Min (PV1, PV2, Ai1)<br>Use one out of PV1, PV2, or Ai1 input, whichever is the smallest, as PV. |
| 11 | Input switching, 2 points | M1 =PV1 when PV1≤ k01, M1 =PV2 when PV1> k01 |

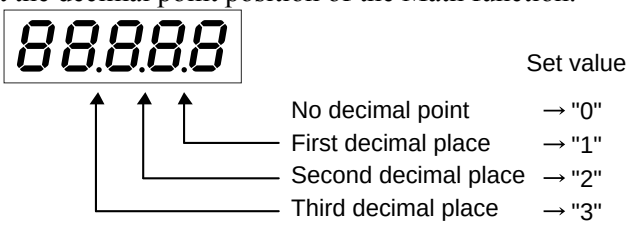
*1: Square root extraction cut point can be set with k06.
*2: Square root extraction cut point can be set with k07.

**2) UCF1 (Ch8-89)**
**UCb1 (Ch8-90)**

· The scale of the full side (upper limit) and the base side (lower limit) of the result of operation used for control operation can be set.

**3) UCd1 (Ch8-91)**

· Select the decimal point position of the Math function.



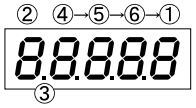

If CALC (CH8-88) is set to 0 (no operation) when TPLT is set to 10 or 11, PV1 becomes the result of operation, and the scale used for control operation becomes UCF1 (Ch8-89), UCB1 (Ch8-90) and UCD1 (Ch8-91).

**4) k01 (Chd-1) to k16 (Chd-16)**

· Substitute arbitrary values into constant k01 (Chd-1) to k16 (Chd-16).

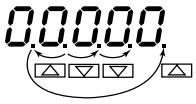
[Setting method]

Setting method of constant is different from the method of setting other parameters.




Press the [▷] key, and digit selection is changed in the order from the 1st, 5th, decimal point, 4th, 3rd, 2nd, and back to the 1st.

Press the [△] key to move the decimal point to the left, and press the [▽] key to move it to the right. When it is moved to the end, it is then moved to the other end.



# 5-15 Setting remote operation prohibition

rih1 Remote operation prohibition setting (Setting range: ON, OFF)

[Description]

**1) rih1 (Ch9-7)**

- Remote operation can be prohibited. (See the following table.)
- Use this function when remote operation function is not required.

| rih1 | Remote operation |
|---|---|
| OFF | Allowed |
| ON | Prohibited |

When rih1 is set to ON, R-ACK of Di function, SV selection of Di function, remote operation function with REM1 parameter, and remote operation function at the time of power ON cannot used.

# 5-16 Remote acknowledge (R-ACK) function

rAC1 Setting of permission of switching to remote operation with Di (Setting range: EnA, inh)

[Description]

**1) rAC1(Ch9-11)**

- Setting of permission of switching to Remote/Auto operation can be made with Di.
- To use this function, set TPLT (Ch8-92) to 10 or 13,
  rAC1 (Ch9-11) to EnA,
  rEM (Ch1-1) to rEM,
  and 60 (Remote acknowledge) to either of Di01 to Di15 (Ch9-39 to 47).

| Setting | Status |
|---|---|
| EnA (Enable) | Remote allowed with Di |
| Inh (inhblt) | Remote prohibited with Di |

| Operation method | Di (R-Ack) | Indication lamp |
|---|---|---|
| Remote Auto | ON | R ON, |
| | OFF | R flickers, A ON |
| Manual | ON | M ON, R flicker, |
| | OFF | M ON, A f lickers |

# 5-17 Setting manual operation prohibition

A-M1 Setting manual operation prohibition (Setting range: A-M, A)

[Description]

**1) A-M1(Ch9-15)**

- Manual operation can be prohibited. (See the following table.)
- Use this function when manual operation function is not required.

| Setting | Operation status |
|---|---|
| A-M | Manual, Auto |
| A | Auto |

When manual operation is prohibited, forced manual operation (SMV) and manual power ON by Di function cannot be performed.

# 5-18 Setting operation mode at the time of power ON

Cnd1 Operation mode setting at the time of power ON (Setting range: A, R, M)

[Description]

**1) Cnd1(Ch9-19)**

- Operation mode at the time of power ON can be set.
- Operation mode can be selected from the following three.
  A: Auto operation
  R: Remote operation
  M: Manual operation
- Setting Cnd1 to R (remote operation)
  Under remote operation prohibition setting, the instrument is started by manual operation when SMV of Di function is set to ON, and in other cases, it is started by auto operation.
- Setting Cnd1 to M (manual operation)
  Under manual switching prohibition setting, the instrument is started by remote operation when R-Ack of Di function is set to ON and rEM1 (Ch1-1) is set to rEM in SV selection, and in other cases, it is started by auto operation.

* See 4-1 “Auto operation,” 4-2 “Manual operation,” and 4-3 “Remote operation” for details of each operation.

# 5-19 SV tracking function

| trk1 | SV tracking function ON/OFF setting (Setting range: ON, OFF) |
|---|---|

[Description]

**1) TRK1(Ch9-23)**

· Tracking of RSV (remote SV) to LSV (local SV) is allowed when operation is switched from Remote to Auto, which is called SV tracking function.

ON: Tracking is performed. (Local SV = Remote SV)

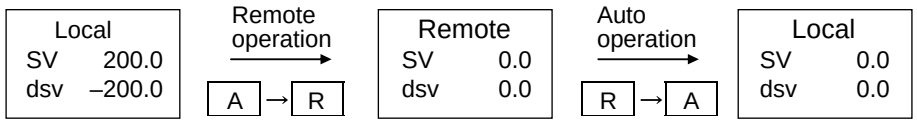
OFF: Tracking is not performed. (Local SV ≠ Remote SV)

Local value at the time of switching to remote operation is restored.

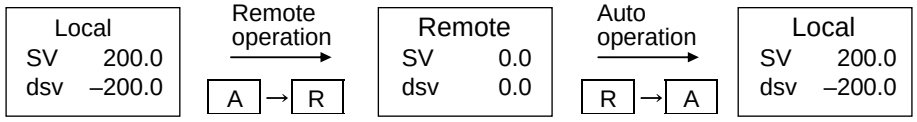
[Example]

When TPLT (Ch8-92) is set to 10 or 13, Local SV is set to 200.0, and remote SV is set to 0.0

When Trk1 = ON




When Trk1 = OFF




* See 3-1 “Setting control template” for details of TPLT (Ch8-92).

[Note]

· If setting is changed from remote SV to local SV during manual operation, the instrument operates as shown above.

· During remote operation, SV tracking setting is used when setting is changed from remote SV to local SV both in auxiliary input Ai1 and SV selection methods.

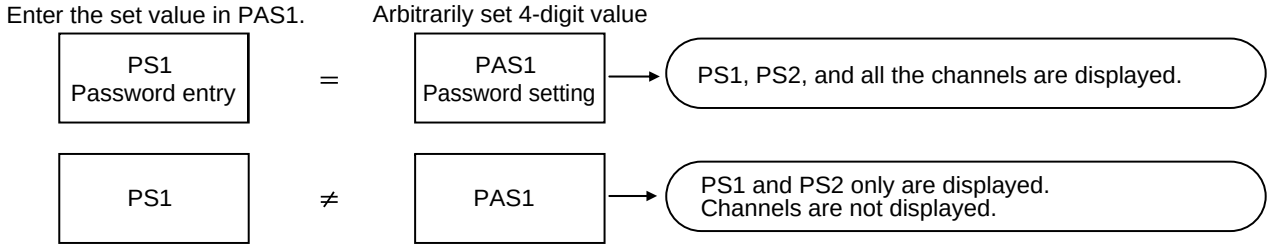
# 5-20 Setting password

PS1 PS2 Password entry (Setting range: 0000 to FFFF)

PAS1 PAS2 PAS3 Password setting (Setting range: 0000 to FFFF)

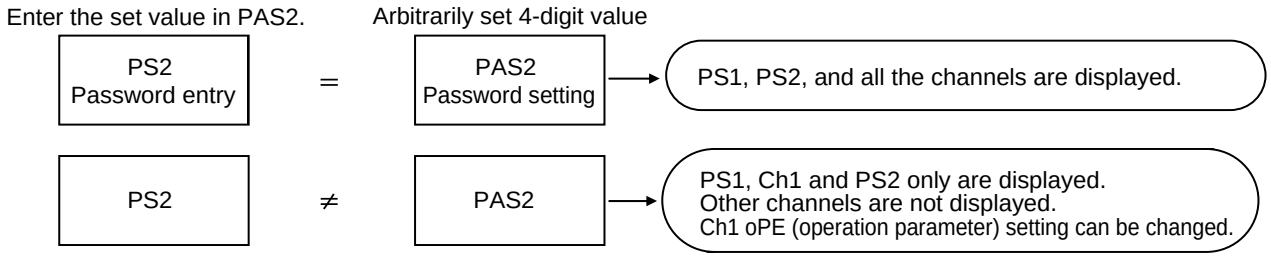
[Description]

**1) PS1-PAS1 (The function prevents people other than the administrator from changing the setting of this instrument.)**




* Do not forget registered password.

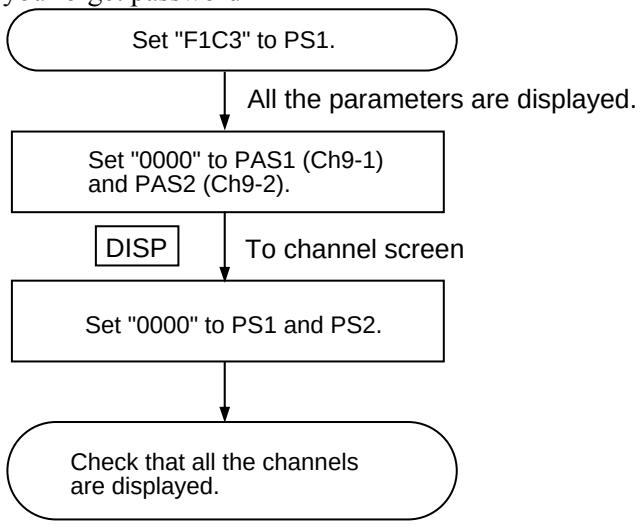
**2) PS2-PAS2 (The function prevents people other than the administrator from changing the settings except for Ch1 oPE (operation parameter).)**


Enter the set value in PAS2.
Arbitrarily set 4-digit value
PS2 Password entry
=
PAS2 Password setting
PS1, PS2, and all the channels are displayed.
PS2
≠
PAS2
PS1, Ch1 and PS2 only are displayed.
Other channels are not displayed.
Ch1 oPE (operation parameter) setting can be changed.

* Do not forget registered password.

[Note]

· If you forget password


Set "F1C3" to PS1.
All the parameters are displayed.
Set "0000" to PAS1 (Ch9-1) and PAS2 (Ch9-2).
DISP
To channel screen
Set "0000" to PS1 and PS2.
Check that all the channels are displayed.

* If "F1C3" is selected, parameters not displayed in normal times are displayed.
Never change the parameters that are not displayed in normal times. Otherwise a failure may result.

* PAS3 is for our maintenance work. Never change the setting. Otherwise a failure may result.

# 5-21 Setting parameter mask

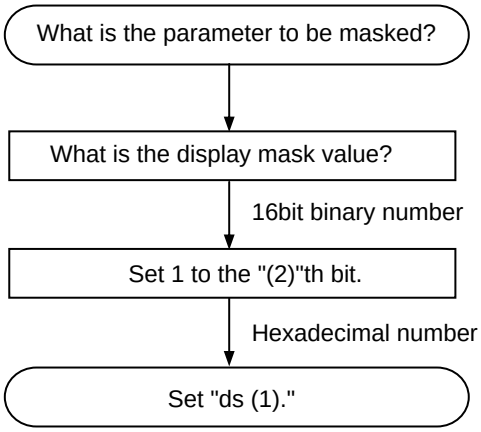
d500 to d543 Parameter mask setting (Setting range: 0000 to FFFF)

[Description]

**1) ds00(Ch9-80) to ds43(Ch9-C3)**

- Unnecessary (unused) parameters can be masked (non-display).
- The function can be used to prevent settings from being changed by mistake.
- See "Display mask" in the parameter list for correspondence between ds00 (Ch9-80) to ds43 (Ch9-C3) setting and parameters to be masked (non-display).
- See the following setting example for setting method.

[Setting example]


What is the parameter to be masked?
What is the display mask value?
16bit binary number
Set 1 to the "(2)"th bit.
Hexadecimal number
Set "ds (1)."

[Example] TC1

See appended parameter list.

$$\frac{03}{(1)} - \frac{13}{(2)}$$

| 4th digit | 3rd digit | 2nd digit | 1st digit | Digit of hexadecimal number |
|---|---|---|---|---|
| 13 | 9 | 5 | 1 | No. of digits of binary number |
| 0 0 0 1 | 0 0 0 0 | 0 0 0 0 | 0 0 0 0 | Binary number |
| 1 | 0 | 0 | 0 | Hexadecimal number |

1000(16)

↓

Set 1000 to ds03 to mask TC1.

Note:

- When the setting of the parameter (dsxx) whose setting is to be changed is other than 0, add current set value to the value calculated as shown above.

Factory-set value of ds00 to ds43

| ds | Set value | ds | Set value | ds | Set value | ds | Set value | ds | Set value |
|---|---|---|---|---|---|---|---|---|---|
| 00 | 8000 | 10 | 0002 | 20 | 0138 | 30 | 00EE | 40 | 0000 |
| 01 | 002E | 11 | 0002 | 21 | 0138 | 31 | 0404 | 41 | 0003 |
| 02 | 0000 | 12 | 0002 | 22 | 01FF | 32 | 1F00 | 42 | 0003 |
| 03 | 4622 | 13 | 0002 | 23 | 011A | 33 | 0000 | 43 | 0003 |
| 04 | FFFF | 14 | 0002 | 24 | 01dF | 34 | FF00 | | |
| 05 | FFFF | 15 | 007F | 25 | 80FC | 35 | 0003 | | |
| 06 | FFFF | 16 | 003F | 26 | 0018 | 36 | 0C31 | | |
| 07 | 0002 | 17 | 0E24 | 27 | 0EEE | 37 | 0307 | | |
| 08 | 0002 | 18 | 0002 | 28 | 0E0E | 38 | 0000 | | |
| 09 | 0002 | 19 | 0002 | 29 | 0007 | 39 | 0076 | | |

- Do not display parameters masked at the time of delivery and change the setting. Otherwise a failure may result.

# 5-22 EX-MV function

EXM1 External manipulated variable setting (Setting range: –25 to 125%)

[Description]

**1) EXM1(Ch2-97)**

- In this mode, the instrument is operated with the MV value set according to the value of external manipulated variable EXM1.
- During EX-MV operation, ordinary MV follows EX-MV.
- To set the control mode to EX-MV, set the EX-MV value and then set Di to ON.

| Di | Output signal |
|---|---|
| OFF | MV in normal times |
| ON | EX-MV |

* During manual operation, if Di allocated with EX-MV is set to ON, EX-MV is not output, but MV set on the operation screen is output.

* Allocation is made to Di4 of each template at the time of delivery.
If EX-MV value is not output when Di4 is set to ON, check if EX-MV (103) is allocated to Di (Ch9-39 to 47).

# 5-23 Setting 2 degree of freedom PID

| AL P 1 | 2 degrees of freedom coefficient α setting (Setting range: –300.0 to 300.0%)) |
|---|---|

| bET 1 | 2 degrees of freedom coefficient β setting (Setting range: 0.0 to 900.0%) |
|---|---|

[Description]

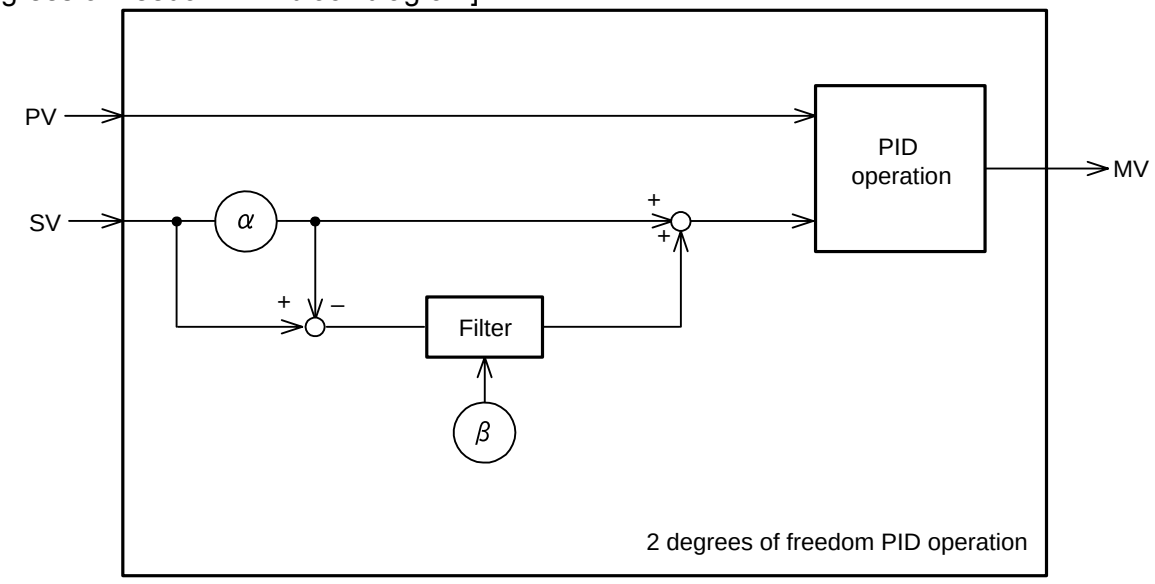
The function is used to suppress overshoot generated in PID control.
The 2 degrees of freedom PID system of this instrument adopts set value (SV) filter method, which is effective at suppressing overshoot at the time of setting change or power ON.

If ALP1 (α) is set to 100.0%, and bET1 (β) to 0.0% (factory-set values), ordinary PID control (1 degree of freedom PID) is performed.
Adjust ALP1 (α) and bET1 (β) as follows.

1) Set ALP1 (α) to 40.0%, and bET1 (β) to 100.0%.
2) Perform control and check responsibility (overshoot volume).
   If overshoot cannot be improved in this stage, adjust ALP1 (α) and bET1 (β), following the definition listed in the following table.
   If ALP1 (α) is not adjusted, no problem arises.
   Therefore, we recommend you to use the instrument with ALP1 (α) set to 40.0%.

| Result of control | bET1 | ALP1 |
|---|---|---|
| Large overshoot | Increase BET1 (β) by 20% | Decrease ALP1 (α) by 10% |
| Small overshoot | Decrease BET1 (β) by 20% | Increase ALP1 (α) by 10% |

[2 degrees of freedom PID block diagram]




[Note]

* Change the setting of ALP1 (α) in manual mode.
  Before changing ALP1 (α) setting, set bET1 (β) to 0.0%. Change ALP1 (α) setting, and then set desired value to bET1 (β) again. Improper procedure may cause output (target value) to increase temporarily, thus posing danger.
* The purpose of this function is to suppress overshoot generated in ordinary PID control. Overshoot may not always be eliminated.

# 6 TROUBLESHOOTING

| Symptom | Possible cause | Remedy | See (page) |
|---|---|---|---|
| 1. Reading appears as UUUU or LLLL. | (1) Input signal of the sensor and settings of parameter PV1T, PV2T, or AI1T do not coincide. | Make the setting of PV1T, PV2T, and AI1T again. | 28 |
| | (2) Polarity of input signal is reversed. | Check the polarity and connect properly. | 115 |
| | (3) Short circuit occurred to the input of B or R thermocouple (PV1T, PV2T = 4, 5). | Set parameters PV1T and PV2T to 3, and check that temperature around normal temperature is displayed. (The error of B and R thermocouples is extremely large near normal temperature. It is not a failure.) | 28 |
| | (4) Input signal of the sensor and the type do not match. | Ask your distributor for modification, or replace it with a proper type unit. | — |
| | (5) Input connection is loose. | Fasten securely. | — |
| | (6) The sensor if broken or short-circuited. | Replace the sensor, or remove the short-circuited part. | 115 |
| | (7) A device connected to the sensor or the input of the main unit is defective. | Replace the sensor or input devices. | — |
| | (8) Parameter PV1B, PV2B, AI1B or UCB1 is set to the value larger than PV1F, PV2F, AI1F, or UCF1 respectively. | Make the setting again to assure PV1B<PV1F, PV2B <PV2F, AI1B <AI1F, and UCB1<UCF1. | 28 |
| | (9) Measurement value is too large or too small. | Extend the setting value for parameters PV1B, PV2B, AI1B, UCB1, PV1F, PV2F, AI1F, and UCF1. | 28 |
| 2. Fractional portion of the reading is not displayed. | Parameter, PV1d, PV2D, AI1D, or UCD1 is set to 0. | Set them in the range from 1 to 3. | 28 |
| 3. SV and set value of some of the parameters change spontaneously. | Parameter PV1b, PV1F, or Pv1d has been changed (when TPTL=13, 14). Parameter UCB1, UCF1, or UCD1 has been changed (when TPLT=10, 11). | Make the setting of all the parameters again. | 116 to 126 |
| 4. ON/OFF control (2-position control) cannot be started. | Parameter P1 is not set to 0.0. | Set P1 to 0.0. | 83 |
| 5. ON/OFF control does not function. | (1) Setting of parameter hS1 is not correct. | Adjust the setting of hS1 according to the control target. | 84 |
| 6. Control does not function properly. | (1) Setting of parameter P1, i1, or d1 is not correct. | Do auto tuning. | 47 |
| | (2) Proportion cycle is too long. | Gradually decrease the setting of parameter TC1. | 41 |
| | (3) Output limit is posed. | Make the setting of parameters MVh1 and MVL1 to the value appropriate for the process. | 82 |

| Symptom | Possible cause | Remedy | See (page) |
|---|---|---|---|
| 7. Reaction is slow. (Measurement value changes very slowly.) | Input filter is too large. | Decrease the setting of parameter P1TF.<br>When PV2 or AI1 is used, decrease the setting of P2TF or A1TF. | 81 |
| 8. Reading does not change although output is turned ON/OFF. | (1) Input is short-circuited. | Remove the short-circuited part. | — |
| | (2) Connection with operation terminal is off. | Connect properly. | 115 |
| | (3) Power for the operation terminal is OFF. | Set the power to ON. | — |
| | (4) Output signal and input signal of the operation unit do not coincide. | Provide a thermoregulator appropriate for the operation terminal, or provide operation terminal appropriate for the signals from the thermoregulator. | — |
| 9. Key operation cannot be performed. Parameter value cannot be changed. | Parameter LOC is set to 1, 2, 4, or 5. | Set LOC to 0 or 3. (If LOC is set to 3, setting cannot be made by communication.) | 87 |
| 10. SV cannot be changed. | (1) Parameter LOC is set to 1 or 4. | Set LOC to 0, 2, 3, or 5. | 87 |
| | (2) Setting of values outside the measurement range (parameters Sh1 to SL1) was attempted. | Extend the range of Sh1 and SL1. (Do not extend the range exceeding the values listed in input range table.) | 46 |
| 11. Parameter to be checked or changed does not appear. | Setting has been made to skip the parameters in question with parameters ds00 to ds43. | Change the setting of the parameter in question in ds00 to ds43. | 106 |
| 12. Auto tuning cannot be done properly. | (1) After auto tuning was started, input was set to UUUU. | Expand the range of parameters PV1d, PV1F, and PV1B when TPLT =13, 14, and expand the range of parameters UCD1, UCF1, and UCB1 when TPLT = 10, 11, and then do auto tuning again. | 28 |
| | (2) After auto tuning was done, SV was changed. | Restore the SV value to be controlled and then do auto tuning again. | 47 |
| | (3) Peripheral devices or connections with those devices are faulty. | Make connections with peripheral devices properly. | — |
| | (4) Forward/reverse operation of thermoregulator and the system of control target do not coincide. | Set parameter rEV1 properly. | 43 |
| | (5) Control target runs out of time in a very slow process (about 17 hours or longer). | Do tuning manually. (Set P1 to 0, and perform ON/OFF control.) | 83 |
| 13. Overshoot is too large in auto tuning. | — | (1) Do auto tuning at ATP1 = LPV (low PV type AT). | 47 |
| | — | (2) Do tuning manually. | — |
| 14. Decimal point cannot be changed. | TPLT has been set to 10 or 11. | Set TPLT to 13 or 14, or change the decimal point of UCd1. | 20 or 28 |

## Error indications

This Controller has a display function to notify when the equipment is not functioning properly. When a problem occurs, remove the cause immediately.
Once the cause has been removed, turn the power OFF then ON again.

| Display | Cause | Control output |
|---|---|---|
| UUUU | (1) Thermocouple sensor wire broken<br>(2) RTD wiring broken<br>(3) PV value above upper limit +5%FS or more<br>(4) RCJ sensor not attached (thermocouple input) | MV (operation output) is output with the value of brd1 (ch9-35).<br>(Output type)<br>(1) HOLD,<br>(2) LO (OFF or low limit value of the AO)<br>(3) HI (ON or upper limit value of the AO)<br>(4) EXMV |
| LLLL | (1) When PV value without fractional portion is under –199.99.<br>Note) In case of the resistance bulb, LLLL is not displayed even if under –150°C. | Control continues.<br>Note) Control continues until below –5%FS.<br>Burnout occurs at below –5%FS. |
| PV not displaying | Standby mode (PV display set to off) | MV (operation output) is output with the value of PMv1 (ch2-22). |
| -19999 or 99999 | Display limit is smaller than over range or under range value. | Control continues.<br>Note) Control continues until under –5%FS or 105%FS. |
| Correct PV not displayed | The main unit was not reset or the power was not turned on after scale setting was changed. | ———— |

# 7 FREQUENTLY ASKED QUESTIONS

Q1 Decimal point of the measurement value (PV) started flickering while parameter setting was being changed. What does the decimal point at the far right mean?
A The decimal point at the far right is kept flickering while auto tuning is being performed. Set AT (Ch1-7) to OFF.

Q2 How is temperature displayed?
A The value rounded off from the lower place value is displayed.

Q3 Can 105°C be expressed as 60°C?
A It is possible by adjustment by the user. Display can be made in the range of ±50% of the full scale range.

Q4 What kind of cables should we use for RS485?
A Use twisted pair cables with a shield. Recommended cable: KPEV-SB (By FURUKAWA)

Q5 PV value has been stably displayed for about a week. Then it increased suddenly for 2 to 3 minutes, and returned back to the original value.
A Effect of noise is considered. Replace the cable with the one provided with a shield.

Q6 P is set to 0.0, but ON/OFF display does not appear.
A There is no ON/OFF display. Either of the two output status of MV, 0% (OFF) or 100% (ON) is displayed.

Q7 Key operation cannot be made.
A The instrument is provided with key lock function, but if the display does not change even if the SEL key is pressed, key failure is considered. Check the type and ask the manufacturer for repair.

Q8 Reading error of 7 to 8°C is observed.
A The error can be adjusted by user adjustment.

Q9 What does 50%FS (full scale) of user adjustment mean?
A Setting can be made within the range of 50% of the measurement range. Up to 200°C can be set if the measurement range is 0 to 400°C.

Q10 MV is not output from Ao.
A Setting of OTYP (Ch8-9), which is output type selection, may have been set to 11 or 13. Set OTYP to 10 or 12.

# 8 SPECIFICATIONS

## General specifications

### General specifications

(1) Power supply voltage:
100V (−15%) to 240V (+10%) AC, 50/60 Hz
(2) Power consumption:
15 VA or less (100 V AC)
20 VA or less (220 V AC)
(3) Insulation resistance:
20 MΩ or more (500 V DC)
(4) Withstand voltage:
Power supply ↔ All terminals;
1500 V AC for 1 minute
Relay output ↔ All terminals;
1500 V AC for 1 minute
Others; 500 V AC for 1 minute

## Input section

### Measurement value input

(1) Number of inputs: 1 or 2 (Option)
(2) Input signal type:
Thermocouple: J, K, R, B, S, T, E, PR40/20, N, PL-II, WRe5-26
Resistance bulb : Pt100Ω (3-wire)
Voltage: 0 to 10 mV DC, 0 to 50 mV DC,
1 to 5 V DC, 0 to 5 V DC, 0 to 10 V DC
Current: 4 to 20 mA DC, 0 to 20 mA DC
(3) Measurement range:
Refer to the measurement range table.
(4) Input indication accuracy (Ambient temperature: 23°C):
・Thermocouple: (±0.1%FS ±1digit ±1°C) or ±1.5°C, whichever is larger
Thermocouple B: 0 to 400°C range;
±5%FS±1digit±1°C
Thermocouple R: 0 to 500°C range;
±1%FS ±1digit ±1°C
・Resistance bulb input: (±0.1%FS ±1digit) or ±0.25°C, whichever is larger
・Voltage input, current input: ±0.1%FS±1digit
(5) Input sampling cycle: 50 ms
(6) Input impedance
・ Thermocouple, voltage input (mV): 1 MΩ or more
・ Voltage input (V): 1MΩ
・ Current input: 250Ω
(7) Influence of source resistance / Permissible wiring resistance
・ Thermocouple, voltage input (mV): 0.1%FS per 100Ω
・ Voltage input (V): 0.1%FS per 500Ω
・ Resistance bulb input: 10Ω or less (per cable)
(8) Permissible input voltage
・ Voltage (V) input: +35 V / −10 V DC
・ Current input: ±25 mA DC
・ Thermocouple/Resistance bulb/Voltage (mV) input: ±5 V DC
(9) Noise reduction ratio
・ Normal mode: 40 dB (50/60 Hz) or more
・ Common mode: 120 dB (50/60 Hz) or more
(10) Input value correction function (Input conditioner)
・ User adjustment:
±50%FS both for zero point and span point
・ Square-root extractor:
OFF or cut point from 0.0 to 125.0%
・ Input filter: 0.0 to 900.0 sec for time constant.

### Auxiliary analog input (Option)

(1) Number of inputs: 1
(2) Input signal
DC voltage: 1 to 5 V DC / 0 to 5 V DC / 0 to 10 V DC
(3) Input accuracy: ±0.2%FS
(4) Sampling cycle: 100 ms
(5) Input impedance: 1 MΩ
(6) Influence of source resistance: 0.2%FS per 500Ω
(7) Permissible input voltage: +35 V / −10 V DC
(8) Noise reduction ratio
・ Normal mode: 40 dB (50/60 Hz)
・ Common mode: 120 dB (50/60 Hz)
(9) Input value correction function
・ User adjustment:
±50%FS both for zero point and span point
・ Square-root extractor:
OFF or cut point from 0.0 to 125.0%
・ Input filter: 0.0 to 900.0 sec. for time constant.

### Digital input (DI)

(1) Number of points:
Basic: 4 (Di1-4)
Expansion: 5 (9 points in total at max.)
(2) Specifications: Contact or transistor input
(3) Contact capacity:
12 V DC, Approx. 2 mA (per point)
(4) Detection pulse width: 200 ms or more
(5) Function: Control mode changeover, EX-MV selection, SV changeover, Control run/standby, Auto-tuning start, Built-in timer start, Alarm latch cancel.

### Math function

(1) Kind of formula:
Select by the parameter setting.
(flow compensation, Average, Hi/Lo selector, input selector)
(2) Operation parameter:
Analog input (PV1, PV2, Ai1),
Constant (K01 - K16)
(3) Data type: Engineering unit (with floating point)

## Output section

### Control output

(1) Number of points: 1
(2) Type: Select one as follows.
1. Relay contact output
・ Contact structure: SPDT contact (Do4 used)
・ Contact capacity:
220V AC / 30 V DC, 3A (Resistive load)
220V AC / 30 V DC, 1A (Inductive load)
・ Life: 100,000 operations (rated load)
2. SSR/SSC driver output (Voltage pulse)
・ Rating: 12 V DC (10 to 15 V DC)
・ Maximum current: 20mA (provided with protection against short circuit)
・ Load resistance: 600Ω or more
3. Current output (4 to 20 mA DC)
・ Accuracy: ±0.2%FS
・ Linearity: ±0.2%FS
・ Load resistance: 600Ω or less

**Digital output**
(1) Number of points:
Basic: 2 (Do3, 4)
Expansion: Maximum 7 (9 points in total at max.)
(2) Specifications:
・Contact structure:
SPST contact (except for Do4)
SPDT contact (Do4)
・Contact capacity:
220 V AC / 30 V DC, 1A (Resistive load)
・Life: 100,000 operations (rated load)
(3) Function: Alarm output, timer output, control output (Do4)

**Analog re-transmission output**
(1) Number of points: 2 at max.
(2) Type: Current output (4 to 20 mA DC)
・ Accuracy: ±0.2%FS
・ Linearity: ±0.2%FS
・ Load resistance: 600Ω or less
(3) Output contents: PV, SV, MV, DV

**Transmitter power supply output**
(1) Number of points: 1 at max.
(2) Rating:
24 V DC (17 to 30 V DC), Maximum current; 23 mA (with short circuit protection)

## Alram function

**Number of alarm points**
・ 8 points for setting

**Type of alarm**
・ PV value (upper/lower limit, absolute/deviation, band), PV variation ratio, SV upper/lower limit, main unit error
<Optional operation>
・ Hold (standby) function
・ Alarm latching
・ Excitation/non-excitation
・ Operation delay: 0 to 9999 sec, 0 to 9999 min

**Alarm output**
・ Allocated to DO1 to DO4 and DO11 to DO15 (Allocation change available.)

## Communication function

**PC Loader interface**
(1) Number of points: 1
(2) Physical specifications: EIA RS232C
(3) Protocol: Modbus-RTU
(4) Communication method:
3-wire, half-duplex, bit serial asynchro-nous communication
(5) Data type, Data length:
8 bits, Parity; Odd/Even/None
(6) Communication speed:
9600 bps, 19200 bps, 38400 bps
(7) Connector: 3-pole, 2.5 mm dia. Sub-miniature jack
* Special cable is prepared as option.

**RS-485 interface**
(1) Number of points: 1
(2) Physical specifications: EIA RS485
(3) Protocol: Modbus-RTU
(4) Communication method:
2-wire, half-duplex, bit serial asynchro-nous communication
(5) Data type, Data length:
8 bits, Parity; Odd/Even/None
(6) Communication speed:
9600 bps, 19200 bps, 38400 bps
(7) Connection topology:
Multi-drop, Up to 31 units can be connected including master device
(8) Communication distance:
500 m max. (Total length of connection)

**Display**
(1) Type: LED
(2) Display contents
Measurement value display:
7 segments, 5 digits (red),
Character height; 20 mm
Setting display: 7 segments, 5 digits (orange),
Character height; 13 mm
Auxiliary display:
7 segments, 2 digits (orange),
Character height; 12 mm
Bar graph: 12 segments (orange)
Status display indicator lamp:
Standby, control mode (R/A/M), output, alarm

## Operation and storage conditions

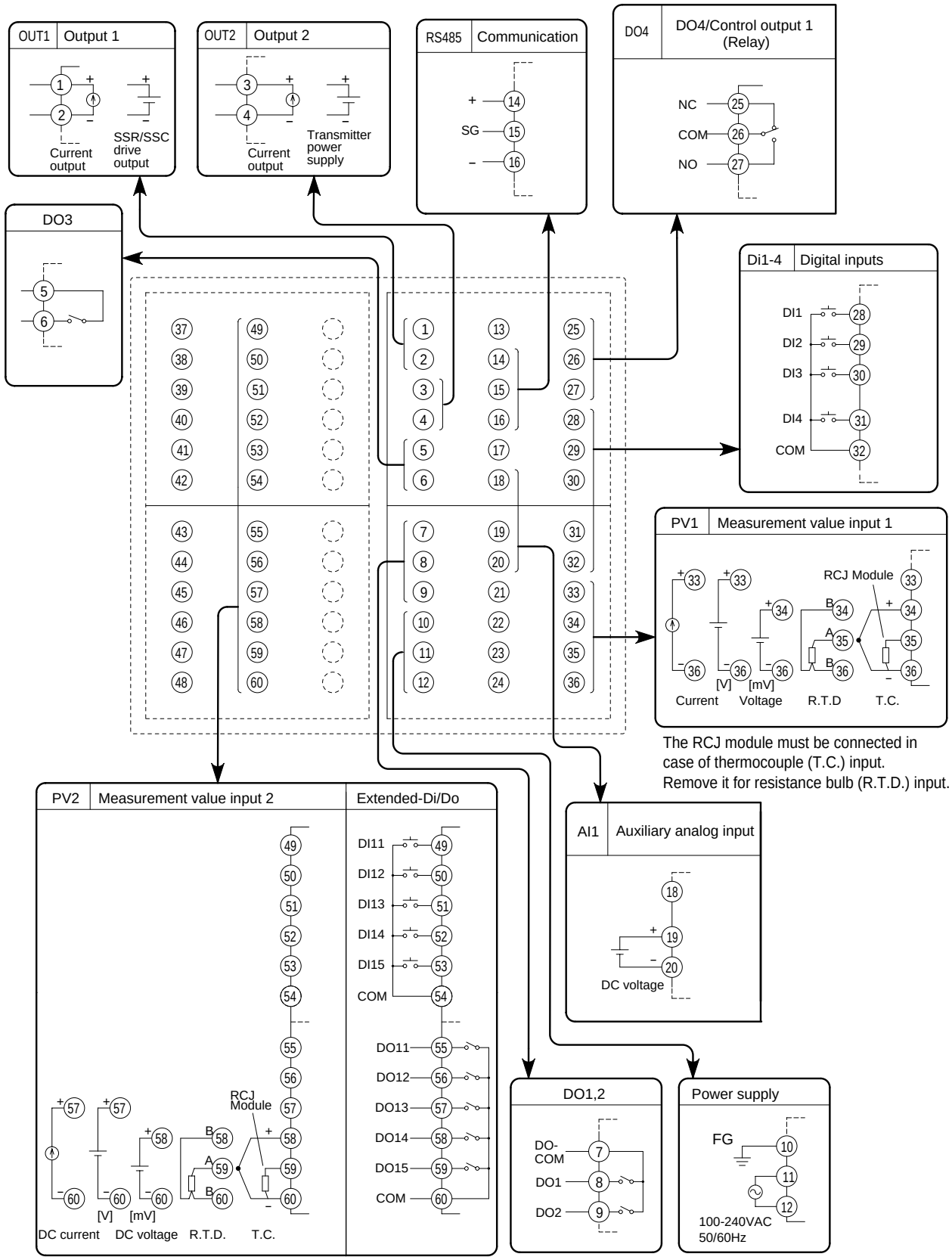
(1) Ambient operating temperature: −10 to 50°C
(2) Storage temperature: −20 to 60°C
(3) Ambient humidity for use/storage:
90% RH or less (non-condensing)
(4) Warm-up time: 15 min. or longer

## Structure

(1) Mounting method: Panel flush mounting
(2) External terminal: M3 screw terminal
(3) Case
・ Material: Plastic (Flame-resistant, UL94V-0)
・ : Gray
(4) Protection
・ Faceplate: IEC IP66, NEMA-4X-equivalent (When mounted on panel with our genuine packing. Waterproof feature unavailable in side-by-side mounting.)
・ Body: IEC IP20 (Provided with slits on top and bottom faces)

・ Terminal section: IEC IP00. Terminal cover can be mounted (option).
(5) External dimension:
96 (W) x 96 (H) x 81.5 (D) mm
* "D" is the depth from the front face of the panel (not including terminal cover).
(6) Mass: Approx. 500 g

# Appendix 1 Terminal connection diagram



# Appendix 2 Parameter list

## Ch1 oPE (Operation parameter)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 | rEM1 | rEM1 | Remote mode | Switches setting between remote/auto mode operation.<br>REM: Remote mode AUT: Auto mode | AUT | 01-1 | See 4-3. |
| 5 | StbY | STbY | Standby command | Switches controller to RUN/Standby.<br>ON: Control standby (output OFF, alarm OFF)<br>OFF: Control RUN | OFF | 01-5 | See 4-5. |
| 7 | AT | AT | Auto-tuning command | Sets auto-tuning.<br>OFF: non action<br>ON1: start auto-tuning. | OFF | 01-7 | See 3-7. |
| 8 | LACh | LACh | Alarm latch cancel command | Disables alarm 1 - 8 latch.<br>OFF: Stopped<br>CLR: Latch clear | OFF | 01-8 | See 3-8. |
| 9 | PLTn | PLTn | Palette selection | Selects a PID palette to be used to control.<br>(Setting range: 0 to 7) | 0 | 01-10 | See 5-6. |
| 10 | AL 1 | AL1 | Alarm settings 1 | Alarm 1 operation value setting.<br>Setting possible within the input range | 10%FS | 02-1 | Displayed when alarm operation type 1TP (chA-1) is set to 1 to 11. (See 3-8.) |
| 11 | A 1-L | A1-L | Alarm lower limit settings 1 | Alarm 1 lower limit operation value setting.<br>Setting possible within the input range | 10%FS | 02-1 | Displayed when alarm operation type 1TP (chA-1) is set to 16 to 31. (See 3-8.) |
| 12 | A 1-h | A1-h | Alarm upper limit settings 1 | Alarm 1 upper limit operation value setting.<br>Setting possible within the input range | 10%FS | 02-1 | Displayed when alarm operation type 1TP (chA-1) is set to 16 to 31. (See 3-8.) |
| ∫ | | | | | | | |
| 31 | AL8 | AL8 | Alarm settings 8 | Alarm 8 operation value setting.<br>Setting possible within the input range | 10%FS | 02-8 | Displayed when alarm operation type 8TP (chA-36) is set to 1 to 11. (See 3-8.) |
| 32 | A8-L | A8-L | Alarm lower limit settings 8 | Alarm 8 lower limit operation value setting.<br>Setting possible within the input range | 10%FS | 02-8 | Displayed when alarm operation type 8TP (chA-36) is set to 16 to 31. (See 3-8.) |
| 33 | A8-h | A8-h | Alarm upper limit settings 8 | Alarm 8 upper limit operation value setting.<br>Setting possible within the input range | 10%FS | 02-8 | Displayed when alarm operation type 8TP (chA-36) is set to 16 to 31. (See 3-8.) |
| 34 | LoC | LoC | Keylock | Selects parameter lock type<br>(Setting range: 0 to 5) | 0 | 01-11 | See 5-7. |

| | Key operation | | Communication | |
|---|---|---|---|---|
| No. | All Parm. | SV/MV | All Parm. | SV/MV |
| 0 | ○ | ○ | ○ | ○ |
| 1 | × | × | ○ | ○ |
| 2 | × | ○ | ○ | ○ |
| 3 | ○ | ○ | × | × |
| 4 | × | × | × | × |
| 5 | × | ○ | × | × |

○: Can be set ×: Cannot be set

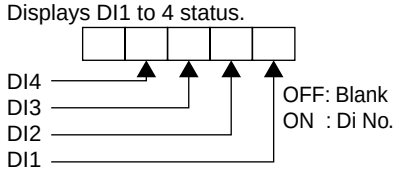
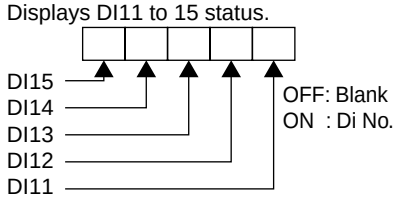
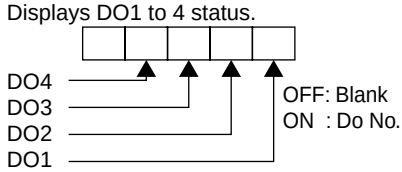
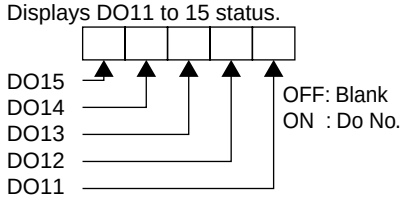
## Ch2 PId (Control parameter)

| Parameter | | | | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| No. | Display | Symbol | Name | | | | |
| 1 | P 1 | P1 | Proportional band | Setting range: 0.0 to 999.9%<br>ON/OFF control at setting = 0. | 5.0 | 03-1 | See 5-3. |
| 2 | i 1 | i1 | Integral time | Setting range: 0.0 to 3200.0 seconds<br>Integral control OFF at setting = 0. | 240.0 | 03-1 | |
| 3 | d 1 | d1 | Derivative time | Setting range: 0.0 to 999.9 seconds<br>Derivative control OFF at setting = 0. | 60.0 | 03-1 | |
| 5 | ArH 1 | Arh1 | Anti - reset windup Upper limit setting value | Integration cut point upper limit setting value<br>(Setting range: 0 to 100%FS) | 100%FS | 03-3 | Sets by deviation from SV. (See 5-5.) |
| 6 | ArL 1 | ArL1 | Anti - reset windup Lower limit setting value | Integration cut point lower limit setting value<br>(Setting range: 0 to 100%FS) | 100%FS | 03-3 | |
| 7 | SH 1 | Sh1 | SV value upper limit | Sets upper limit SV<br>(Setting range: −25 to 125%FS) | 100%FS | 03-4 | See 3-6. |
| 8 | SL 1 | SL1 | SV value lower limit | Sets lower limit SV<br>(Setting range: −25 to 125%FS) | 0%FS | 03-4 | |
| 9 | MvH 1 | Mvh1 | MV value upper limit | Sets upper limit MV<br>(Setting range: −25.0 to 125.0%FS) | 105.0 | 03-5 | See 5-2. |
| 10 | MvL 1 | MvL1 | MV value lower limit | Sets lower limit MV<br>(Setting range: −25.0 to 125.0%FS) | -5.0 | 03-5 | |
| 13 | dMv 1 | dMv1 | MV change ratio limit | Sets the limit value of deviation of MV (DMV) in one control cycle (50ms.)<br>(Setting range: 0.0 to 150.0%)<br>0.0: No limit | 0.0% | 03-7 | Limit is not applied to the deviation of MV by EX-MV operation. (See 5-2.) |
| 14 | dT 1 | dT1 | Sampling cycle | Sets sampling cycle for PID operation.<br>(Setting range: 5 to 1000) | 5 | 03-8 | The actual cycle is (Set value × 10) ms. (See 5-3.) |
| 15 | hS 1 | hS1 | Hysteresis setting | Hysteresis value during ON/OFF control time. (Setting range: 0 to 50%FS) | 0.3%FS | 03-9 | See 5-4. |
| 18 | bAL 1 | bAL1 | Operation output convergence value | Sets output convergence value<br>(Setting range: −100.0 to 100.0%) | 0.0% | 03-12 | See 5-5. |
| 19 | TC 1 | TC1 | Cycle time of Control output (MV1) | Sets proportional cycle for control output.<br>(Setting range: 1 to 150 sec) | By designation at the time of ordering | 03-13 | Effective only for RY output and SSR drive output. (See 3-5.) |
| 20 | rEv 1 | rEv1 | Control operation setting | Sets a control operation method.<br>NRML: Normal operation<br>REV: Reverse operation | REV | 03-14 | See 3-5. |
| 22 | PMv 1 | PMv1 | Preset value for control output | Sets MV for stanby.<br>(Setting range: -25.0 to 125.0%) | 0.0 | 03-16 | See 4-5. |
| 23 | ALP 1 | ALP1 | Alpha | Sets 2 degrees of freedom coefficient α. (Setting range: −300.0 to 300.0%) | 100.0 | 40-1 | See 5-23. |
| 24 | bET 1 | bET1 | Beta | Sets 2 degrees of freedom coefficient β. (Setting range: 0.0 to 999.9%) | 0.0 | 40-1 | |
| 97 | EXM 1 | EXM1 | External control amount | Sets external output value.<br>(Setting range: −25.0 to 125.0%) | 0.0 | 07-1 | See 5-22. |
| 99 | kF 1 | kF1 | FF gain | Sets Feed Forward gain and bias 1, bias 2.<br>[FF = KF1 × (Input − B1F) + B2F]<br>(Setting range: −1000.0 to 1000.0) | 0.0 | 40-2 | |
| A0 | b1F 1 | b1F1 | FF bias1 | | 0.0 | 40-2 | |
| A1 | b2F 1 | b2F1 | FF bias2 | | 0.0 | 40-2 | |

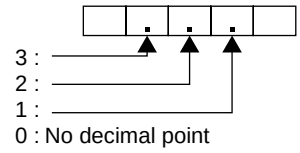
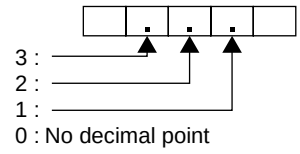
## Ch3 PLT (Control palette)

| Parameter | | | | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| No. | Display | Symbol | Name | | | | |
| 1 | SV1 | Sv1 | Setting value 1 | Palette 1 SV<br>(Setting range: SV lower limit value to SV upper limit value) | 0%FS | 08-1 | See 5-6. |
| 2 | P-1 | P-1 | Proportional band 1 | Palette 1 proportional band<br>(Setting range: 0.0 to 999.9%)<br>ON/OFF control at setting = 0. | 5.0 | 08-1 | |
| 3 | i-1 | i-1 | Integral time 1 | Palette 1 integral time<br>(Setting range: 0.0 to 3200.0 sec)<br>Integral control OFF at setting = 0. | 240.0 | 08-1 | |
| 4 | d-1 | d-1 | Derivative time 1 | Palette 1 derivative time<br>(Setting range: 0.0 to 999.9 sec)<br>Derivative control OFF at setting = 0. | 60.0 | 08-1 | |
| 6 | ArH1 | Arh1 | Anti - reset windup upper limit value 1 | Palette 1 Anti - reset windup upper limit value setting.<br>(Setting range: 0 to 100%FS) | 100%FS | 08-1 | |
| 7 | ArL1 | ArL1 | Anti - reset windup lower limit value 1 | Palette 1 Anti - reset windup lower limit value setting.<br>(Setting range: 0 to 100%FS) | 100%FS | 08-1 | |
| 8 | HYS1 | hYS1 | Hysteresis setting 1 | Palette 1 hysteresis setting<br>(Setting range: 0 to 50%FS) | 0.3%FS | 08-1 | |
| 11 | bL-1 | bL-1 | Output convergence value 1 | Palette 1 Output convergence value<br>(Setting range: −100.0 to 100.0%) | 0.0% | 08-1 | |
| ⟆ | | | | | | | |
| 67 | SV7 | Sv7 | Setting value 7 | Palette 7 SV<br>(Setting range: SV lower limit value to SV upper limit value) | 0%FS | 14-1 | See 5-6. |
| 68 | P-7 | P-7 | Proportional band 7 | Palette 7 proportional band<br>(Setting range: 0.0 to 999.9%)<br>ON/OFF control at setting = 0. | 5.0 | 14-1 | |
| 69 | i-7 | i-7 | Integral time 7 | Palette 7 integral time<br>(Setting range: 0.0 to 3200.0 sec)<br>Integral control OFF at setting = 0. | 240.0 | 14-1 | |
| 70 | d-7 | d-7 | Derivative time 7 | Palette 7 derivative time<br>(Setting range: 0.0 to 999.9 sec)<br>Derivative control OFF at setting = 0. | 60.0 | 14-1 | |
| 72 | ArH7 | Arh7 | Anti - reset windup upper limit value 7 | Palette 7 Anti - reset windup upper limit value setting.<br>(Setting range: 0 to 100%FS) | 100%FS | 14-1 | |
| 73 | ArL7 | ArL7 | Anti - reset windup lower limit value 7 | Palette 7 Anti - reset windup lower limit value setting.<br>(Setting range: 0 to 100%FS) | 100%FS | 14-1 | |
| 74 | HYS7 | hYS7 | Hysteresis setting 7 | Palette 7 hysteresis setting<br>(Setting range: 0 to 50%FS) | 0.3%FS | 14-1 | |
| 77 | bL-7 | bL-7 | Output convergence value 7 | Palette 7 Output convergence value<br>(Setting range: −100.0 to 100.0%) | 0.0% | 14-1 | |
| 78 | rEF1 | rEF1 | PID switch point 1 | Palette 1 PID switch point<br>(Setting range: −25 to 125%FS) | 0%FS | 08-1 | |
| ⟆ | | | | | | | |
| 84 | rEF7 | rEF7 | PID switch point 7 | Palette 7 PID switch point<br>(Setting range: −25 to 125%FS) | 0%FS | 14-1 | See 5-6. |

## Ch7 Mon (Monitor)

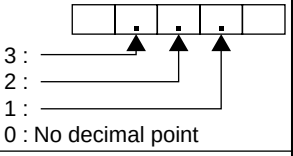
| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 | PV1 | Pv1 | PV1 monitor | Displays Process value 1 input. | – | 17-1 | See 4-6 |
| 2 | PV2 | Pv2 | PV2 monitor | Displays Process value 2 input. | – | 17-2 | |
| 4 | AI1 | Ai1 | AI1 monitor | Displays Analog input 1 input. | – | 17-5 | |
| 6 | rSV1 | rSv1 | RSV1 monitor | Displays REMOTE set value 1 temperature. | – | 17-9 | |
| 10 | LSV1 | LSV1 | Local SV1 monitor | Display Local set value 1 | – | 17-9 | |
| 14 | rCJ1 | RCJ1 | RCJ1 monitor | Displays RCJ1 input. | – | 17-1 | |
| 15 | rCJ2 | RCJ2 | RCJ2 monitor | Displays RCJ2 input. | – | 17-2 | |
| 17 | Ao1 | Ao1 | AO1 monitor | Displays Analog output 1 output value. | – | 18-1 | |
| 18 | Ao2 | Ao2 | AO2 monitor | Displays Analog output 2 output value. | – | 18-1 | |
| 21 | dC01 | Di01 | DI monitor 1 | Displays DI1 to 4 status.<br>  | – | 19-1 | |
| 22 | dC11 | Di11 | DI monitor 2 | Displays DI11 to 15 status.<br>  | – | 19-1 | |
| 24 | do01 | DO01 | DO monitor 1 | Displays DO1 to 4 status.<br>  | – | 19-1 | |
| 25 | do11 | DO11 | DO monitor 2 | Displays DO11 to 15 status.<br>  | – | 19-1 | |
| 27 | AIM | AiM | Calculation result monitor | Displays user's calculation result. | – | 19-3 | |
| 28 | TM1 | TM1 | Alarm delay remaining time monitor | Displays the remaining time for the alarm delay of ALM1 to ALM8. | – | 34-1 | |
| 29 | TM2 | TM2 | | | | 34-2 | |
| 30 | TM3 | TM3 | | | | 34-3 | |
| 31 | TM4 | TM4 | | | | 34-4 | |
| 32 | TM5 | TM5 | | | | 34-5 | |
| 33 | TM6 | TM6 | | | | 34-6 | |
| 34 | TM7 | TM7 | | | | 34-7 | |
| 35 | TM8 | TM8 | | | | 34-8 | |
| 36 | AMV1 | AMV1 | EXMV value | Displays the value to be output as EXMV. | – | 17-9 | |
| 40 | FFV1 | FFV1 | Feed Forward value | Displays the value of Feed Forward element. | – | 17-9 | |

## Ch8 SET (Input/output definition)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 | P1 1F | Pv1F | PV1 full-scale | Sets the full-side scale of PV1 input. (Setting range: −19999 to 99999) | As ordered | 20-1 | See 3-2. |
| 2 | P1 1b | Pv1b | PV1 base scale | Sets the base-side scale of PV1 input. (Setting range: −19999 to 99999) | As ordered | 20-1 | |
| 3 | P1 1d | Pv1d | PV1 decimal point position | Specifies the decimal point position of PV1 input. (Setting range: 0 to 3)<br>  <br>3 :<br>2 :<br>1 :<br>0 : No decimal point | 1 | 20-1 | |
| 4 | P1 1T | Pv1T | PV1 input type | Sets the type of PV1 input. (Setting range: 0 to 27) | As ordered | 20-1 | |
| 5 | P1 1U | Pv1U | Unit | Sets the measurement unit.<br>non : No unit<br>˚F : ˚F unit<br>˚C : ˚C unit | As ordered | 20-2 | |
| 6 | P1 1Z | Pv1Z | PV1 input zero point adjustment | Sets the correction value of a zero point for PV1 input. (Setting range: -50 to 50%FS) | 0%FS | 20-3 | See 5-9. |
| 7 | P1 1S | Pv1S | PV1 input span point adjustment | Sets the correction value of a span point for PV1 input. (Setting range: -50 to 50%FS) | 0%FS | 20-3 | |
| 11 | P 1CU | P1CU | PV1 input rooter cut point | Sets the cut point of square-root extraction calculation for PV1 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%) | OFF | 20-7 | See 5-1. |
| 12 | P 1TF | P1TF | Time constant of PV1 input filter | Sets the constant during filter for PV1 input. (Setting range: 0.0 to 900.0 sec) | 0.0 | 20-8 | |
| 14 | P2 2F | Pv2F | PV2 full-scale | Sets the full-side scale of PV2 input. (Setting range: −19999 to 99999) | As ordered | 20-1 | See 3-2. |
| 15 | P2 2b | Pv2b | PV2 base scale | Sets the base-side scale of PV2 input. (Setting range: −19999 to 99999) | As ordered | 20-1 | |
| 16 | P2 2d | Pv2d | PV2 decimal point position | Specifies the decimal point position of PV2 input. (Setting range: 0 to 3)<br>  <br>3 :<br>2 :<br>1 :<br>0 : No decimal point | 1 | 20-1 | |
| 17 | P2 2T | Pv2T | PV2 input type | Sets the type of PV2 input. (Setting range: 0 to 27) | 3 | 20-1 | |
| 18 | P2 2U | Pv2U | Unit | Sets the measurement unit for PV2 input.<br>non : No unit<br>˚F : ˚F unit<br>˚C : ˚C unit | ˚C | 20-2 | |
| 19 | P2 2Z | Pv2Z | PV2 input zero point adjustment | Sets the correction value of a zero point for PV2 input. (Setting range: -50 to 50%FS) | 0%FS | 20-3 | See 5-9. |
| 20 | P2 2S | Pv2S | PV2 input span point adjustment | Sets the correction value of a span point for PV2 input. (Setting range: -50 to 50%FS) | 0%FS | 20-3 | |
| 24 | P2CU | P2CU | PV2 input rooter cut point | Sets the cut point of square-root extraction calculation for PV2 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%) | OFF | 20-7 | See 5-1. |
| 25 | P2TF | P2TF | Time constant of PV2 input filter | Sets the constant during filter for PV2 input. (Setting range: 0.0 to 900.0 sec) | 0.0 | 20-8 | |

Note) Be sure to reset or turn on the power after parameter setting is changed.

## Ch8 SET (Input/output definition)

| Parameter | | | | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| No. | Display | Symbol | Name | | | | |
| 40 | AI 1F | Ai1F | Ai1 full scale | Sets the full-side scale of analog (Ai1) input. (Setting range: −19999 to 99999) | As ordered | 23-1 | See 3-2. |
| 41 | AI 1b | Ai1b | Ai1 base scale | Sets the scale of base-side analog (Ai1) input. (Setting range: −19999 to 99999) | As ordered | 23-1 | |
| 42 | AI 1d | Ai1d | Ai1 decimal point position | Specifies the decimal point position for analog (Ai1) input. (Setting range: 0 to 3)<br>  <br>3 :<br>2 :<br>1 :<br>0 : No decimal point | 1 | 23-1 | |
| 43 | AI 1T | Ai1T | Ai1 input type | Sets the type of Ai1 input. (Setting range: 16 to 18) | 16 | 23-1 | |
| 45 | AI 1Z | Ai1Z | Ai1 input zero point adjustment | Sets the correction value of a zero point for Ai1 input. (Setting range: -50 to 50%FS) | 0%FS | 23-3 | See 5-9. |
| 46 | AI 1S | Ai1S | Ai1 input span point adjustment | Sets the correction value of a span point for Ai1 input. (Setting range: -50 to 50%FS) | 0%FS | 23-3 | |
| 49 | A 1CU | A1CU | Ai1 input rooter cut point | Sets the cut point of the square-root extraction calculation for Ai1 input. In case of OFF, the square-root extraction is not calculated. (Setting range: OFF, 0.0 to 125.0%) | OFF | 23-7 | See 5-1. |
| 50 | A 1TF | A1TF | Time constant of Ai1 input filter | Sets the constant during filter for Ai1 input. (Setting range: 0.0 to 900.0sec) | 0.0 | 23-8 | |
| 64 | Ao 1T | Ao1T | AO1 output type | Switches the AO1 (re-transmission output) signal.<br>Setting range: PV, SV, MV, DV, AiM, S1, S2, S3 | PV | 25-1 | See 3-9. |
| 66 | Ao 1h | Ao1h | AO1 output scale upper limit | Sets the scale upper limit value of the AO1 output. (Setting range: −130.0 to 130.0%) | 100.0% | 25-1 | |
| 67 | Ao 1L | Ao1L | AO1 output scale lower limit | Sets the scale lower limit value of the AO1 output. (Setting range: −130.0 to 130.0%) | 0.0% | 25-1 | |
| 68 | A 1Lh | A1Lh | AO1 output limit upper limit | Sets the upper limt value of the AO1 output limit. (Setting range: -25.0 to 105.0%) | 105.0% | 25-1 | |
| 69 | A 1LL | A1LL | AO1 output limit lower limit | Sets the lower limt value of the AO1 output limit. (Setting range: −25.0 to 105.0%) | −5.0% | 25-1 | |
| 70 | Ao2T | Ao2T | AO2 output type | Switches the AO2 (re-transmission output) signal.<br>Setting range: PV, SV, MV, DV, AiM, S1, S2, S3 | PV | 25-2 | |
| 72 | Ao2h | Ao2h | AO2 output scale upper limit | Sets the scale upper limit value of the AO2 output. (Setting range: −130.0 to 130.0%) | 100.0% | 25-2 | |
| 73 | Ao2L | Ao2L | AO2 output scale lower limit | Sets the scale lower limit value of the AO2 output. (Setting range: −130.0 to 130.0%) | 0.0% | 25-2 | |
| 74 | A2Lh | A2Lh | AO2 output limit upper limit | Sets the upper limt value of the AO2 output limit. (Setting range: −25.0 to 105.0%) | 105.0% | 25-2 | |
| 75 | A2LL | A2LL | AO2 output limit lower limit | Sets the lower limt value of the AO2 output limit. (Setting range: −25.0 to 105.0%) | −5.0% | 25-2 | |

Note) Be sure to reset or turn on the power after the parameter setting is changed.

## Ch8 SET (Input/output definition)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 88 | CALC | CALC | Calculation | Selects the calculation type. (Setting range: 0 to 11) | 0 | 25-9 | See 5-14. |
| 89 | UCF1 | UCF1 | UCAL full scale | Sets the scale on the full side which is utilized for mathematical calculations. (Setting range: −19999 to 99999) | As ordered | 25-9 | |
| 90 | UCb1 | UCb1 | UCAL base scale | Sets the scale on the base side which is utilized for mathematical calculations. (Setting range: −19999 to 99999) | As ordered | 25-9 | |
| 91 | UCd1 | UCD1 | UCAL decimal point position | Sets the decimal point position for mathematical calculations. (Setting range: 0 to 3) | 1 | 25-9 | |
| 92 | TPLT | TPLT | Template | Specifies the template.<br>The range of effective setting.<br>10 : Single-loop basic PID control (with Math function)<br>11 : Single-loop SV selection PID control (with Math function)<br>13 : Single-loop basic PID control<br>14 : Single-loop SV selection PID control<br>16 : Single-loop input selection PID control (with Math function)<br>Setup other than the above is forbidden. | 13 | 25-10 | See 3-1. |
| 93 | oTYP | oTYP | Output type | Selects the control output selector type. (Setting range: 10 to 13) | As ordered | 25-11 | See 3-3. |
| 98 ⟆ b3 | Cn01 ⟆ Cn16 | CN01 ⟆ CN16 | Constant 1 ⟆ Constant 16 | Sets a constant value used for templates. The meaning of the value varies depending on template. Make the setting after checking the description of each template. (Setting range: −19999 to 99999) | 0 | 25-15 | |

Note) Be sure to reset or turn on the power after the parameter setting is changed.

## Ch9 SYS (Sysytem definition)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 | PAS1 | PAS1 | Security setting 1 | Sets security (passwords). (Setting range: 0000 to FFFF) | 0000 | 26-1 | See 5-20. |
| 2 | PAS2 | PAS2 | Security setting 2 | Sets security (password). (Setting range: 0000 to FFFF) | 0000 | 26-2 | |
| 3 | PAS3 | PAS3 | Security setting 3 | Sets security (password). (Setting range: 0000 to FFFF) | 0000 | 26-3 | |
| 7 | rCh1 | rih1 | Remote mode setting prevention | Prevents switching to the REMOTE mode. (Setting range: ON/OFF) | OFF | 27-1 | See 5-15. |
| 11 | rAC1 | rAC1 | R_ACK use selection | Selects use or non-use of R_ACK. (Setting range: INH, ENA) | INH | 27-5 | See 5-16. |
| 15 | A-M1 | A-M1 | A/M mode | Selects the A/M mode. (Setting range: A-M, A) | A-M | 27-9 | See 5-17. |
| 19 | Cnd1 | Cnd1 | Mode settings when the power turns ON. | Sets the mode when the power turns ON. (Setting range: A, R, M) | A | 28-1 | See 5-18. |
| 23 | Trk1 | Trk1 | Tracking method selection (SV) | Selects ON or OFF for tracking the local set value (SV) | ON | 28-9 | See 5-19. |
| 30 | STBo | STBo | Operation settings when in standby mode | Sets the front display operation in the standby mode. (Setting range: 0: lighting, 1: extinction) | 0 | 29-4 | See 4-5. |
| 31 | PLTS | PLTS | Palette switching method selection | Selects a palette switching factor. (Setting range: PLTn, SV, PV) | PLTn | 29-6 | See 5-6. |
| 32 | F1 | F1 | User designation key-1 (F1) | Sets user assignments for function keys. [F1] - [F3]. (Setting range: 0 - 27) | 0 | 29-7 | See 5-13. |
| 33 | F2 | F2 | User designation key-2 (F2) | | 0 | 29-8 | |
| 34 | F3 | F3 | User designation key-3 (F3) | | 0 | 29-9 | |
| 35 | brd1 | brd1 | Burn out direction specification (MV1) | Specifies the direction of the control output during a burnout. (Setting range: HOLD, LO, UP, EXMV) | Lo | 30-1 | See 5-8. |
| 39 ⟆ 42 | dC01 ⟆ dC04 | di01 ⟆ di04 | Assignment for digital input 1 ⟆ Assignment for digital input 4 | Sets assignments for DI1-DI4, DI11-DI15. (Setting range: 0 - 255) | di01 : 60 di02 : 70 di03 : 0 di04 : 103 | 31-1 | See 5-10. |
| 43 ⟆ 47 | dC11 ⟆ dC15 | di11 ⟆ di15 | Assignment for digital input 11 ⟆ Assignment for digital input 15 | | 0 | 31-2 | |
| 53 ⟆ 56 | do1 ⟆ do4 | do1 ⟆ do4 | Assignment for digital output 1 ⟆ Assignment for digital output 4 | Sets assignments for DO1-DO4, DO11-DO15. (Setting range: 0 - 255) | do1 : 1 do2 : 2 do3 : 3 do4 : 4 | 31-9 | See 5-11. |
| 57 ⟆ 61 | do11 ⟆ do15 | do11 ⟆ do15 | Assignment for digital output 11 ⟆ Assignment for digital output 15 | | 0 | 31-10 | |

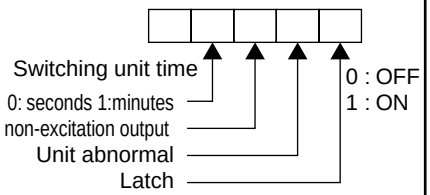
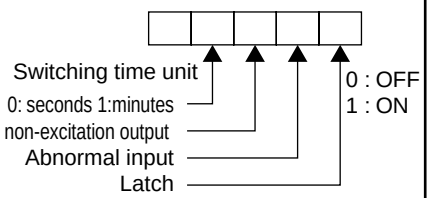
Note) Be sure to reset or turn on the power after the parameter setting is changed.

## Ch9 SYS (Sysytem definition)

| Parameter | | | | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| No. | Display | Symbol | Name | | | | |
| 67 | C1 | C1 | LED C1 assignment | Allocates indicator LEDs.<br>(Setting range: 0 to 255) | 21 | 32-1 | See 5-12. |
| 68 | C2 | C2 | LED C2 assignment | | 22 | 32-2 | |
| 69<br>∫<br>73 | Ldo1<br>∫<br>Ldo5 | Ldo1<br>∫<br>Ldo5 | LED DO1 assignment<br>∫<br>LED DO5 assignment | | Ldo1 : 1<br>Ldo2 : 2<br>Ldo3 : 3<br>Ldo4 : 4<br>Ldo5 : 0 | 32-3<br>32-4<br>32-5<br>32-6<br>32-7 | |
| 74 | LALN | LALM | LED ALM assignment | | 17 | 32-8 | |
| 80<br>∫<br>C3 | dS00<br>∫<br>dS43 | dS00<br>∫<br>dS43 | Parameter mask setting | Skips (not display) unnecessary parameters. | – | 0-1<br>∫<br>0-15 | See 5-21. |
| E3 | rES | rES | Reset command | Resets the main unit.<br>ON : Reset<br>OFF : Normal | OFF | 33-1 | See 3-4. |

Note) Be sure to reset or turn on the power after parameter setting is changed.

## ChA ALM (Alarm setting)

| Parameter | | | | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| No. | Display | Symbol | Name | | | | |
| 1 | 1TP | 1TP | Alarm 1 type setting | Sets the alarm type for alarm 1.<br>(Setting range: 0 to 38) | 0 | 34-1 | See 3-8. |
| 2 | 1oP | 1oP | Alarm 1 option setting | Sets alarm options for alarm 1.<br>(Setting range: 0000 to 1111)<br>  <br> | 0000 | 34-1 | |
| 3 | 1hYS | 1hYS | Alarm 1 hysteresis setting | Sets alarm hysteresis for alarm 1.<br>(Setting range: 0.00 to 50.00%FS) | 0.3%FS | 34-1 | |
| 4 | 1dLY | 1dLY | Alarm 1 delay time setting | Sets delay time for alarm 1.<br>(Setting range: 0 to 9999)<br>* Sets alarm options for time units. The unit of time is selected by alarm options. | 0 | 34-1 | |
| ⟆ | | | | | | | |
| 36 | 8TP | 8TP | Alarm 8 type setting | Sets the alarm type for alarm 8.<br>(Setting range: 0 to 38) | 0 | 34-8 | See 3-8. |
| 37 | 8oP | 8oP | Alarm 8 option setting | Sets alarm options for alarm 8.<br>(Setting range: 0000 to 1111)<br>  <br> | 0000 | 34-8 | |
| 38 | 8hYS | 8hYS | Alarm 8 hysteresis setting | Sets alarm hysteresis for alarm 8.<br>(Setting range: 0.00 to 50.00%FS) | 0.3%FS | 34-8 | |
| 39 | 8dLY | 8dLY | Alarm 8 delay time setting | Sets delay time for alarm 8.<br>(Setting range: 0 to 9999)<br>* Sets alarm options for time units. The unit of time is selected by alarm options. | 0 | 34-8 | |

## ChB CoM (Communication)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 2 | STn4 | STn4 | RS485 station No. | Specifies RS485 communication station No. (Setting range: 0 to 255)<br>* does not operate with STn4=0. | 1 | 36-2 | See 3-11. |
| 3 | SPd4 | SPd4 | RS485 communication speed | Selects communication speed for RS485 communication.<br>(Setting range)<br>96 : 9600 bps<br>192 : 19200 bps<br>384 : 38400 bps | 384 | 36-3 | |
| 4 | biT4 | biT4 | RS485 bit format | Selects bit format for RS485 communication.<br>(Setting range)<br>8n: Data length 8, Parity None<br>8o: Data length 8, Parity Odd<br>8E: Data length 8, Parity Even | 8o | 36-4 | |
| 7 | SPd2 | SPd2 | PC Loader communication speed | Selects the communication speed for PC Loader communication. (Setting range)<br>96 : 9600 bps<br>192 : 19200 bps<br>384 : 38400 bps | 384 | 36-9 | |
| 8 | biT2 | biT2 | PC Loader bit format | Selects the bit format for PC Loader communication.<br>(Setting range)<br>8n: Data length 8, Parity None<br>8o: Data length 8, Parity Odd<br>8E: Data length 8, Parity Even | 8o | 36-10 | |

Note) Be sure to reset or turn on the power after parameter setting is changed.

## ChD CLC (Mathematical calculation)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 ~ 16 | K01 ~ K16 | K01 ~ K16 | Constant for mathematical calculation | Sets the constant used for mathematical calculation | 0.0000 | 38-1 ~ 38-4 | See 5-14. |

## ChE AT (Tuning)

| Parameter No. | Parameter Display | Parameter Symbol | Parameter Name | Content Explanation | Factory default | Parameter mask | Notes |
|---|---|---|---|---|---|---|---|
| 1 | ATP1 | ATP1 | Auto tuning type | Specifies the auto-tuning method.<br>(Setting range)<br>NRML : Standard type AT<br>LPV : Low PV type AT | NRML | 39-1 | See 3-7. |

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